THE

ELECTRICAL REVIEW.

VOL. LXXIV. JUNE 12, 1914. No. 1,907.

ELECTRICAL REVIEW.

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THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. *Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEEKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 933; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, 19s. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND, N.Z.: Gordon & Gotch, Albert Street; The Mining and Engineering Review, 31A, Strand Arcade, Queen Street.
BERLIN: Asher & Co., Unter den Linden; Speyer & Peters, Unter den Linden 43, N.W. 7.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.
LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: The Mining & Engineering Review, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: The Mining & Engineering Review, 273, George Street; Gordon and Gotch, Pitt Street.
TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.
WELLINGTON, N.Z. Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."

THE UNIVERSAL ELECTRICAL DIRECTORY

(J. A. Berly's).

1914 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

A QUESTION OF STATUS.

IF the Dublin Section of the I.E.E. has not yet been dubbed the Fighting Section, we give it now the accolade. It did yeoman service for the profession when the new Articles were under discussion, and may fairly claim to have helped forward the healthy democratic movement more during that stressful period than any other Section has done in recent times. Now the bugle has sounded the advance once more against the seeming apathy of the central body, and the Dublin Section is thundering in the charge with steady ranks.

We print elsewhere an abstract of the proceedings at a meeting of the Fighting Section, at which the matter discussed was of the first importance to the profession as a whole. It was concerned with no epoch-making discovery, for, as one speaker said, it is 20 years old. It was, in fact, the time-worn, if not time-honoured, subject of professional status.

What intensity of feeling there is amongst the general body of members may be gauged by observing the common-place, insignificant little match which lighted the train to the powder barrel; nothing more, in fact, than a municipal job. The Dublin speakers emphasised the fact that the meeting was not called to criticise the jobbers, and we will follow their polite example for what we take to be the same reasons, (*a*) that criticism would be impious, (*b*) that the resulting hell-broth of ink and mud and vituperation would obscure the real issue as hopelessly as the path of a frightened squid is veiled by its own dark emissions.

It is necessary, nevertheless, for the proper understanding of the sudden and determined action of the Fighting Section, to state that the Electricity Supply Committee drew the attention of the Dublin City Council to the procedure which governs the training and improvement of the junior engineers on the staff of its Electricity Department. It is an excellent procedure, or programme, and as such we give it in brief, and commend it to less forward Councils:—

1. Candidates for apprenticeship must have passed through certain electrical courses, and are subjected to an examination by the city electrical engineer as to their general fitness for the profession.

2. The selected candidates are indentured for two years.

3. The Corporation, although not binding itself to do so, finds employment in junior positions for such apprentices as have shown the necessary ability.

4. Subject always to the young engineer showing reasonable progress, his course up the ladder of promotion was as follows until 1913:—

First period.—Switchboard attendant in the main distributing station at £65, rising in two years to £78.

Second period.—Switchboard attendant at the generating station at £78, rising in two years to £104.

Third period.—Shift engineer at the main distributing station at £104, rising in two years to £130.

Fourth period, and the last for junior engineers.—Shift engineer at the generating station at £130, rising in two years to £156.

In 1913 the Committee revised the salaries and increased the maxima for the various periods to £104, £130, £156 and £200, and at the same time it took a notable step towards the most praiseworthy end of improving the professional status of its junior engineers:—

5. It made an order expressing the opinion that members of the staff desirous of promotion should pass the examination for Associate Membership of the I.E.E., and it proposed to take this into consideration in future cases of promotion, and when applications for increments were submitted.

We doubt if the Council of the Institution, or even the Dublin Local Section, could have drafted a more satisfactory prospectus for the junior engineers of our supply systems. Hardly had the ink dried on the minute book in London in which, presumably, a record was made of the decision to institute examination as a test for Associate Membership, than the Dublin Electricity Committee seized the opportunity to advance its admirable work for the uplifting of the professional electrical engineer. The members of that Committee did, in fact, forestall and anticipate the desire of the Fighting Section which the latter expressed in restrained, dignified and reasoned language at the meeting which inspired this article.

We are deeply grateful to the Dublin Electricity Committee for its enlightened efforts, intended primarily, of course, for the improvement of the public service which it directs, but having a reflex effect which may and should be felt over a much wider area.

Not less grateful may we be to it for appointing, or, more strictly speaking, recommending the appointment of a man to the responsible position of assistant and deputy to the engineer in charge of consumers' connections, who does not appear to have complied with any one of the requirements which are set out above under five headings. He was, in fact, appointed in 1912 as a permanent wireman at the standard wage of 36s. per week, and the Committee made the present appointment (at a salary of £156, rising in five years to £200) in the face of a totally adverse report from the city electrical engineer, and over the heads—so it was stated at the meeting of the Local Section—of 17 junior engineers.

This was the incident that brought the Fighting Section into line for another gallant charge, and that is why the Dublin Electricity Committee deserves our thanks.

It is high time that the Council should bestir itself to get something more effective and certain for the members of a profession, which ought to be honoured, than sporadic local recognition which can be rendered useless whenever—let us say—the Lord Mayor's cook goes to take tea with an aspiring wireman's mother-in-law.

Mr. Tomlinson, hon. secretary to the Fighting Section, and it seems, in this case as in the other, the man behind the gun, quoted from the Electrical Review of January 15th, 1909, a pungent satire entitled: "The Status of the Electrical Engineer," by "Tito," in which the deadly grievance and disability under which our profession suffers were laid bare. "Tito" did not merely scarify our wounds: he suggested healing them, and the remedy is as fresh and good now as it was five years ago, when he compounded it; part of it, indeed, has been applied.

He desired to see established at once a matriculation examination for Students I.E.E., and a graduation examination for A.M.I.E.E., and he urged electrical engineers to obtain an Act in conjunction with the Civil Engineers, the Mechanical Engineers, and the Architects, which would protect the properly accredited and registered members of these societies from, as an example, the jobbing propensities of municipal bodies.

"Tito" wanted no more, in fact, than the doctors, lawyers, dentists and other professional men have obtained, either because the public or they themselves became sufficiently alive to their own interests to make things unpleasant until they got what they wanted.

The immediate outcome of the Dublin meeting was the following resolution:—

"That this appointment (by the Dublin Corporation) is a direct attack upon the profession, and that the Committee be instructed to communicate with the Council of the Institution of Electrical Engineers, urging upon them the necessity of promoting immediately such legislation as shall protect the trained professional engineer in the exercise of his profession, as the trained professional man in other professions is protected."

The Society of Architects was formed for an identical purpose, and is working still to that end. A circular letter of June, 1913, issued by that Society contains arguments for the registration under an Act of Parliament of all architects, the whole of which can be used with equal cogency in our own case, and we suggest that valuable mutual assistance might be given by the two Societies in any application to Parliament.

The following extract from the letter puts the case for action concisely:—

> The first effect of an Architects' Registration Act would be to give an immediate and definite impulse to architectural education and training, by setting up a compulsory standard of qualification. The chief weakness of the present voluntary system of architectural examinations is that they are not obligatory (except under certain conditions for admittance to membership of architectural bodies). At present such examinations are not in any case essential as a preliminary to the practice of architecture or to the claiming of the title of architect.
>
> The ultimate result of such an Act of Parliament would be that the unqualified practitioner would be gradually eliminated by efflaxion of time without inflicting injustice or hardship on anyone, and without creating a monopoly, while the public would have a guarantee that in employing any architect they would secure the services of a person possessed of at least the minimum qualifications required for the proper performance of his very onerous duties.

The action of the Council will be awaited with interest.

Rubber. Considering the amount of rubber coming forward for sale lately, when fully 2,000 tons went under the hammer inside of 10 days, the market must really be considered to have given a very good account of itself. Certainly the sales held just prior to the Whitsun holidays passed off without any fresh feature, but it is at least satisfactory to be able to record that there was no further weakness in prices compared with those ruling at the close of the former series. Consumption is going on very well, and indeed in some branches it is stated that there is a certain amount of difficulty being experienced in turning out manufactured products at a sufficiently rapid rate. At all events, there has been talk of a scarcity of tennis balls, the same authority which has unearthed this item of news adding that but for the cold weather which was recently experienced and which hindered playing, while at the same time allowing makers to pick up their arrears, the lack of balls might have kept courts idle indefinitely. It is, however, probable that the early arrival of the summer weather, regardless of the calendar, and the increasing popularity of the game itself, are the prime factors in this particular respect. Be this as it may, the demand for rubber at the auctions has proved quite regular, even though the interest shown by America was indifferent. Good judges are now inclined to consider that the price has fallen to a point sufficiently low to be regarded as pretty safe, but enlarged speculative interest in the article is hardly likely to develop yet awhile, or, at all events, until the general trade and financial positions have cleared up a good deal. One thing which is still militating against the market, is the abstention of interest on the part of United States consumers whose purchases in the London market have become of less and less importance, though a few weeks ago a very fair business was reported as having been done across the Atlantic.

The standardisation of rubber continues to excite a good deal of interest, and complaints are made that it is practically impossible for plantation managers to attain any definite standard of quality owing to the innate variability of the latex produced on different plantations, but it is too late now to kick against the pricks. Standardisation has to be faced sooner or later, and the proposals put forward by the Rubber Growers' Association form a step in the right direction. It is not to be expected that the matter can be put into complete shape at once, but the drift of affairs is at the same time unmistakeable. It is probably impossible

to evolve a scheme which would please everyone, but a start has been made, and progress is certain, even though it may be slower than its originators may like. *Festina lente* is, nevertheless, not a bad maxim. A sign of the lessened haste to put rubber on the market, and thus free the sales from immature produce, is seen in the spreading of the practice of allowing an increased interval of time between the tappings, and the reduction in the number of cuts made. Reformation in both of these respects, while having as a first effect a reduction in the output of the trees, would ultimately result in the crop reaching the normal, with a large reduction in the labour costs of the plantation adopting the plan, which, it may be remarked, is finding advocates and supporters.

According to official returns, the exports of plantation rubber from the Federated Malay States for the month of May amounted to 2,069 tons, compared with 1,225 tons in the corresponding month last year, and 2,151 tons in April last.

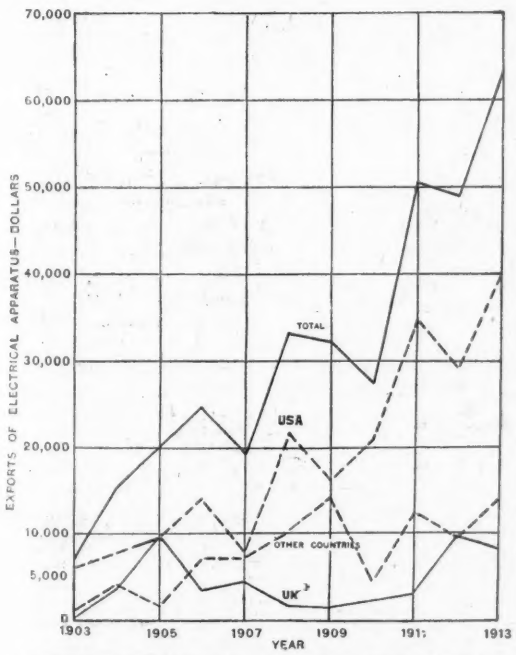
	1912.	1913.	1914.
January	1,218	2,131	2,542 tons
February... ...	1,212	1,757	2,364 ,,
March	1,379	1,737	2,418 ,,
April	1,020	1,626	2,151 ,,
May	1,007	1,225	2,069 ,,
Total, 5 months...	5,836	8,476	11,544

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

The Department of Trade and Commerce has recently published its reports for the fiscal year ended March 31st, 1913, and from the figures given the accompanying curves have been prepared.

The term "Electric Apparatus" which appears on these curves includes carbons, electric light, and carbon points of all kinds, N.O.P.; carbons over 6 in. in circumference; electric apparatus, N.O.P., insulators of all kinds, &c., electric and galvanic batteries, telephone and telegraph instruments; electric motors, generators, dynamos and



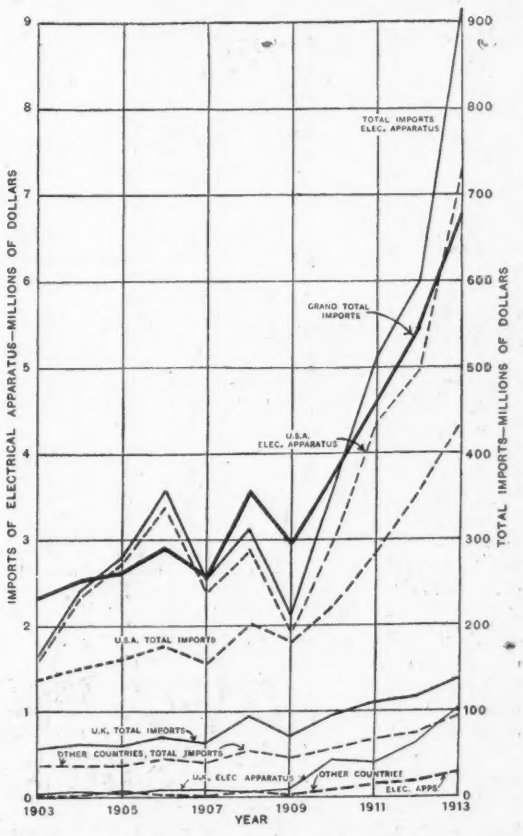
EXPORTS OF ELECTRICAL APPARATUS FROM CANADA.
Based on 1913 Report of the Department of Trade and Commerce, Ottawa.

sockets; fuse heads of metal, foil, or cardboard, for use in the manufacture of fuses; incandescent lamp bulbs and glass tubing for use in the manufacture of incandescent lamps, and mantle stocking for gas lighting.

It is rather curious to note that the curves of "Exports from Canada," are of the same general character as those of "Imports into Canada;" in fact, on the respective scales to which they happen to have been drawn, they almost coincide if laid one over the other, though the actual monetary values for "Electric Apparatus" are vastly different. The curves of "Imports into Canada" will be the more interesting to manufacturing firms at home, especially, of course, those showing imports of "Electric Apparatus," the curves of "Total Imports" having only been given for the sake of comparison. The similarity in the general trend of the curves for these two items is, however, as noteworthy in this case as in the one cited above.

Referring now specially to the curves of "Imports into Canada," and dealing only with those for "Electric Apparatus," it will be seen that, as has already been pointed out in these notes in discussing similar curves in other years, the U.S.A. is still very far in advance of Great Britain.

Considering the disabilities under which British firms labour here, the showing is not at all a bad one, but it will be a great pity if these firms do not during the next few years do something towards securing a greater share of a



IMPORTS OF "ELECTRICAL APPARATUS" INTO CANADA, AND "TOTAL IMPORTS."

business which, as is plainly shown by the curves, is increasing at a very rapid rate—it has doubled within the last $3\frac{1}{2}$ years, and while the imports from Great Britain have increased during the same period by some 25 per cent., those from the U.S.A. have increased by about 95 per cent.

It is very possible that the United States will always secure the lion's share of the electrical trade of this country, owing to her geographical position, and to the fact that American standards have been already adopted here to such an extent that it is unlikely that they will ever be altered, but in referring to "disabilities" above, the writer had in mind several difficulties which might, if attacked in the right manner, be removed, or at least minimised considerably. This matter will be touched upon in the next "Notes." In the meantime, it is hoped that the curves now presented will furnish food for thought.

D

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Institution and the Electrical Industry.

The article in your issue of June 5th on the "Fate of the Industrial Committee," and the general attitude of the Council which has thus come to light, voices a most widespread dissatisfaction.

I notice that you mention the Council's action of a few years ago under the title of the "broader policy." I think the Council's present action might very well be described as the "old woman policy," since they are evidently fully determined to do nothing—but to be "academic," *i.e.*, "sit and talk." It is quite obvious that the Council's idea of the work of the Institution is that it should be a kind of Grandmotherly Debating Society. No-one would object to a society for such harmless diversions if it did not usurp a position which should be occupied by a properly operative body, and if it did not spend the huge number of subscriptions which are at its disposal in such futilities. It is surely quite time that the members of the Institution asserted themselves, and made sure that the Institution which they supported was being run in their interests, and not for the vanity and advertisement of the few. So far as numbers are concerned, the members of the Institution are —with but a few exceptions—dependent for their livelihood on the commercial success of the electrical industry. It is not a matter of academic interest, but one of bread and butter.

The despised "commercial side" have got to furnish their incomes, and even the money to pay their subscriptions. Now this being so, are not the present attitude of the Council and the present operations of the Institution a ridiculous spectacle?—and if anything is more ridiculous it is any talk of the Council about keeping up the "dignity of the Institution." Why, even two-thirds of the Council themselves are dependent for their own living upon selling, in some form or other, electricity to the public—ashamed though they may pretend to be in Council of having to do with such vulgarities as buying and selling. However, it may be supposed that the business instincts of this latter section are still to the top (but take an oblique direction) by their recognising that it pays them—so far as their personal position at the Institution is concerned—to take sides for the moment with the top dog. In short, the original "Society of Telegraphic Engineers and Electricians" has developed into a "National Institution of Electrical Engineers," but is still under the old *régime* which it has long ago outgrown.

It is for the members now to see that some drastic alterations in constitution and policy take place. They want to see something for their subscriptions beyond the privilege of listening to a few papers which they could just as easily read in the technical Press, and they also want to see that the magnificent premises which are their property are put to far more extensive use. The only people who can do this are those who are frankly interested in the commercial development of the electrical industry, *i.e.*, those who are really in earnest in increasing the amount of business in electricity done in England. It is the commercial side who hold the purse-strings, and who can make possible more and better paid positions for the technical men.

Commercial.

London, *June 8th*, 1914.

Comparative Economics of Tramways and Railless Electric Traction.

The correspondent in your issue of the 5th inst., signing himself "The Critic," implies that the basis of comparison in my I.C.E. paper was of a railless car seated for 28 passengers with an L.C.C. car carrying 78 passengers. He is doubly wrong. In the first place, my estimates of capital cost, weight, current consumption and other working expenses cover the operation of a railless car to carry 56 passengers.

In the second place, in my comparisons I have altogether neglected the L.C.C. cars, as "The Critic" might easily have seen from the diagrams.

The L.C.C. tramways occupy a unique position in tramway statistics both as to capacity and capital expenditure. The latter figure is about £87,000 per mile of route. My assumption of tramway cost for purpose of generalisation is only £28,000 for the case of densest traffic considered.

Although "The Critic's" traffic studies of the L.C.C. cars at Westminster and Blackfriars Bridges are no doubt interesting, I am not concerned with any project for railless electric traction installations in those places, and must, therefore, be content to note his data.

"The Critic" refers to a statement made before a Committee of the House of Lords in regard to road maintenance at Rotherham which he accepts as proof of fact, and from which he draws deductions. This is nothing more than expert evidence. No such sum has been paid, or adjudicated to be paid. The matter is *sub judice*, and it is not usual among professional men to build up a case upon *ex parte* evidence. Expert evidence of this kind is "merry and bright." "The Critic," in his first letter, swallows the statement of one surveyor of road damage of 2d. per mile. In his second letter, with increased avidity he swallows that of another surveyor of 4d. per mile. I can assist him with another piece of "expert evidence." It was sworn to by a member of the Institution of Municipal and County Engineers before a Committee of the House of Commons, and was to the effect that the damage of the motor-'bus was 10d. per mile. We are getting on!

"The Critic" states his opinion that in any case where traffic calls for a headway of 20 minutes or less, a tramway is to be preferred to railless traction or petrol-'buses. Every one is entitled to his opinion, on however slender ground he may choose to base it. The fact remains, however, that the petrol-'bus competes favourably with the tramway where the traffic is very much more dense than the limit set by "The Critic." I do not know of any case where the tramway has ousted the petrol-'bus, however dense the traffic may be.

I quite agree with "The Critic" that for workmen's cars the fare should be less than 1d. per mile, but I do not see why the general public should be carried for less. When the Parliamentary fare on railways was fixed, a penny had much greater purchasing power than it has now. Corporations may be indirectly benefited by developing suburban rateable areas, at the expense of an unremunerative tramway fare. It is, however, often not the result of a progressive, sound, economic policy, but of compulsion from competition.

In my previous reply, I put to "The Critic" the case of York tramways, which he has not answered, although he professes to do so. He stated in his first communication that the proportion of earning capacity of the railless car to the tramcar should be taken as 1 to 1·6. I applied this to the case, and asked him whether he would stand by his assumption.

He now admits that the earning capacity might be the same, but states that the railless car could not be worked at the working expenses, nor could it be bought for the price assumed in my paper. He thus shifts his ground for one upon which he is equally insecure.

The working expenses of a car carrying 40 passengers do not differ materially from those of one carrying 28. The double-decked car is much shorter, and weighs no more than the single-decked car. The cost is also about the same. It is worked by the same staff. It should also be borne in mind that *ceteris paribus* the price of cars decreases as the production increases. The tramcar is made in very large quantities, and to standardised patterns.

I think that anonymous writers might refrain from inferences regarding the personal knowledge and experience of those who are not afraid to give their names.

"The Critic" volunteers the description of his long experience of Parliamentary Committees and the Board of Trade, also as giving responsible advice in a great many cases. It might interest his numerous clients to see the arguments which he urges with a force equal, if not superior, to his knowledge of the question at issue, supported by his name. I suggest, however, that if any of these numerous

clients are considering the alternative of a tramway or a railless line "where traffic calls for a headway of 20 minutes or less," they might as an alternative to "The Critic's" advice, consult one of the municipal engineers who has both tramways and railless lines under his responsible management, both as to working expenses and cost of construction. It would be still open to these to avail themselves of "The Critic's" valuable services for inviting tenders.

T. Graham Gribble.

London, E.C., *June 8th*, 1914.

"Wireless Telegraphy and Telephony."

We have to thank you for the long and careful review which appears in the June 5th issue of your valuable paper.

We are not surprised that the reviewer should repeatedly point out that 5s. is much too high a price to ask for such a comparatively small book. He has, however, been misinformed. The price of the volume is 2s., not 5s., and this, we think, removes what would undoubtedly have been a serious objection to the volume.

May we ask you to have the kindness to remove in your next issue the mistaken impression thus given to your readers?

Seeley, Service & Co., Ltd.

[We regret the error, the source of which we have not been able to trace. The reviewer was not responsible for it. —Eds. Elec. Rev.]

Arc Lamps and Electric Cranes.

Can anyone inform me where I can obtain statistics of the annual cost of upkeep of 10-ampere flame arc lamps (not magazine), and also similar information regarding the cost of 30-cwt. electric jib cranes?

H. T.

BLEACHING BY OZONE.

On Thursday last week, by the courtesy of Messrs. Ozonair, Ltd., we were enabled to inspect a bleaching plant which they have recently constructed to the order of the Eparchial Candle Works of St. Petersburg; the plant will be used for bleaching the beeswax of which the candles used by the Russian Orthodox Church are made, and has been designed for an output of one ton of wax per day of 10 hours.

The treatment of oils, fats and waxes with ozone, whether directed towards the bleaching, deodorising, oxidising or refining of the material, or to several of these purposes simultaneously, depends for its action mainly upon the powerful oxidising properties of ozone, and the methods and plant adopted are almost identical in all these cases, the process consisting in forcing ozonised air through the substance under treatment. The plant therefore consists of apparatus for generating ozone and conducting it into the material, which is contained in vats provided, if necessary, with heating coils. The accompanying illustration shows diagrammatically such an installation, and corresponds closely with the one which we saw in operation at a soap works in Brentford.

The plant consists essentially of an electrically-driven blower, an air cooler, a battery of ozone generators, and the vessel in which the material is treated. The blower has a capacity of 100-300 cb. ft. of air per minute, according to the speed at which it is driven, and the resistance of the column of material in the treating vessel. The blower is water-cooled in order to render its efficiency higher, and to take away as much as possible of the heat of compression. The power taken by the blower is about 3 KW.

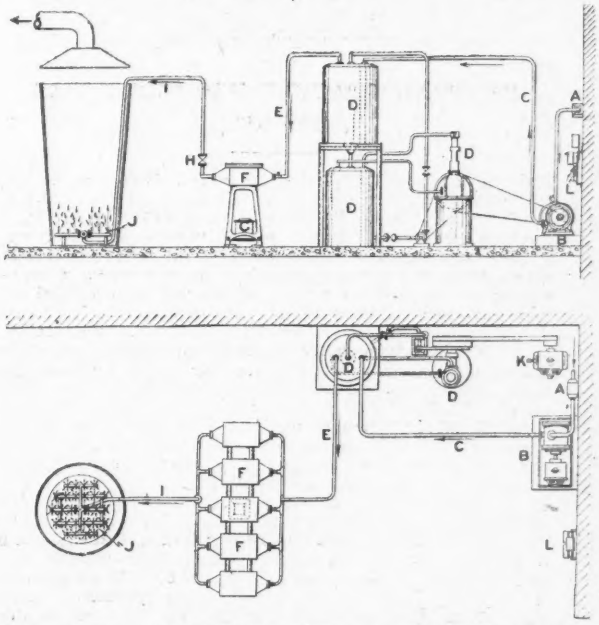
The air after leaving the blower passes into a preliminary cooler, the object of which is to assist the refrigerating plant by further cooling of the air by means of cold water. This cooler consists of a galvanised steel tank in which cold water circulates through a series of gilled pipes. The resulting temperature of the air is about the same as the temperature of the air before it enters the blower.

The air now passes into the cooler of the CO_2 refrigerating apparatus; this is worked on the direct expansion system, and the power taken is approximately 3 KW. The temperature of the air issuing from the refrigerating apparatus is about 0° C. The object of this cooling of the air is, first, to dry the air by deposition, and, secondly, to keep the electrodes of the ozonisers cool, and thus increase their efficiency.

The air now enters the bank of ozonisers through pipes arranged to give an equal volume of air to each generator. The ozonisers are constructed on the well-known Ozonair system. The electrodes consist of flat sheets of wire gauze, made of a special alloy and separated by a dielectric of specially-prepared micanite. Each ozoniser has an electrode surface of 40 sq. ft. The high-pressure current is supplied by three transformers, each supplying current to three ozonisers coupled up in parallel. The secondary voltage varies from about 7,000 to 9,000 volts, and is capable of regulation by means of the primary winding of the transformer. The amount of power consumed by each ozoniser varies from about 300 to 600 watts, according to the secondary voltage. The power factor is low, but, as the ozone generators take a leading current, this is a very desirable feature from the point of view of the supply authorities. The switchboard is arranged so that the power consumed by each ozoniser can be measured and complete regulation and control obtained. The ozonised air passes into a series of pipes which lead it through the melted material at the bottom of the treatment vessel. The total amount of power taken by the complete plant amounts to (approximately) 10 KW., so that to bleach 1 ton of beeswax takes approximately 100 KW.-hours. The same plant can be used for bleaching various other materials, such as palm oil, tallow, &c., and the amount of energy taken per ton of these materials varies also. For instance, for bleaching palm oil, the energy required is much less than for bleaching beeswax, and amounts approximately to 50 KW.-hours per ton.

Comparing the relative advantages of this method of bleaching beeswax with the chemical method ordinarily adopted, it will be seen that the cost is relatively very small, and shows a great advantage in favour of the Ozonair system. The chemical method at present used for bleaching wax is what is known as the bichromate method, and consists in heating the beeswax for several hours in contact with bichromate of potash and sulphuric acid, the quantities used being for each ton of beeswax, 5 cwt. of sulphuric acid and 1½ cwt. of bichromate of potash. The cost of these chemicals alone amounts to about £3 15s., as compared with the cost of 100 KW.-hours, or, say, an average of about 5s. in this country. To this sum of 5s. must be added the interest on capital cost, depreciation and maintenance of the ozone bleaching plant; but even with this addition, the total cost represents a very great advantage in favour of bleaching by ozone.

In the chemical method of bleaching, there is a considerable loss of material due to the chemical action and what is technically known as "charring." This loss in the case of ozone is practically negligible. Again, the wax bleached by ozone attains a degree of hardness or brittleness much superior to that resulting from the chemical method of bleaching, and this is a great advantage when



A, Air cleaner; B, Electrically-driven blower; C, Air-delivery pipe; D, Air cooling machine; K, Electric motor; E, Cold-air delivery pipe; F, Ozone generators; G, Transformer; H, Valve; I, Ozone pipe; J, Ozone injectors; L, Switchboard.

Lay-out of Ozone Bleaching Plant.

the beeswax is used for candle making. Another advantage is that the wax bleached by ozone remains pure and uncontaminated, whereas very special means are needed in order to free the wax from the mixture of chemicals when that method is used.

By taking samples of the wax at intervals, the progress of the operation is easily watched, and during our visit the charge of beeswax—received in a nut-brown condition—made marked progress towards the attainment of the desired standard, the last sample taken being of a creamy whiteness. The plant has, in fact, exceeded the anticipations of its makers, and the duration of the process may be materially shortened, with corresponding economy of energy. The cost of the treatment, therefore, will be even less than is indicated above.

LEGAL.

POSTMASTER-GENERAL *v.* STAFFORDSHIRE COUNTY COUNCIL.

AT Stafford County Court on 5th inst. an application was made to his Honour Judge Ruegg on behalf of the Postmaster-General with respect to the refusal of the Staffordshire County Council to allow overhead telegraph poles and wires to be erected over a distance of about a mile on Lichfield Road, at Weeping Cross, in the direction of Stafford. According to the report in the *Birmingham Daily Post* the Post Office had made application to the County Council for permission to erect the poles and wires, but the County Council refused to grant permission on the ground that the district in question was a residential one and the erection of poles and wires would destroy the amenities of the neighbourhood. The question which was raised by the County Council was that the wires should be put underground.

It was explained that the proposed telegraph wires would form part of the long-distance trunk line from London to Ireland, and that the cost of underground wires was much more than that of overhead, and they were not so efficient.

His HONOUR inspected the district, and on the Court resuming he gave judgment in favour of the Postmaster-General.

ALLEGED BOGUS WIRELESS TELEGRAPH COLLEGE.

ALFRED HENRY MAYNE (31), electrical engineer, a defendant in the Sheffield wireless telegraphy case, failed to appear at the Sheffield Quarter Sessions on the 22nd ult., to answer charges against him. He had been allowed bail, and it was stated that he had gone abroad. His co-defendant, Thos. Jones (58), electrical engineer, was in Court. It was alleged that defendants kept a bogus wireless telegraphy college, and they were charged with conspiring by false pretences to obtain 10 guineas from Robert Loxley, fitter, 274, School Road, Sheffield, and 10 guineas from John Comins, miner, Doe Lea, Chesterfield.

MR. WADDY, who appeared for Mayne, said he could not understand his client's absence. A letter dated April 1st from Rapallo, Italy, had been received from him that morning by his solicitor in Sheffield, and Mr. Waddy thought there was real reason for believing that the man did not know that the Sessions were being held at this time, and that letters sent to him by his solicitors had not reached him.

The case was adjourned until the next Sessions, Jones being allowed bail upon his own recognisances.

CENTRAL STATION PRODUCER GAS PLANT.

FROM an article by M. H. Parodi, in the *Génie Civil*, we learn that during 1913 the producer gas plant laid down at Tours in 1908 by the Cie. Chemin de fer d'Orleans generated 645 million cb. ft. of gas, 30 per cent. of which was used in various heating furnaces, and the remainder in producing 3,338,000 KW.-hours of electrical energy distributed to the company's works and yards. Since its opening the capacity of the plant has been more than doubled, and there are now at work 14 gas producers, each capable of supplying 20,400 cb. ft. per hour of gas worth 124-136 B.TH.U. per cb. ft. Twelve producers are of the Taylor rotating grate type, and use anthracite coal; the remaining two are of the Riché type (with reducing column of incandescent coke), and burn wood refuse. The Taylor producers were designed to burn hard anthracite of 12,500-14,300 B.TH.U. per lb. calorific value, containing at most 10 per cent. ash and 10 per cent. volatile matter, but they operate equally well on coal with more ash, so long as the latter does not form slag. Sifted "frasil" from loco. fire-boxes gives good results if mixed with 50 per cent. to 60 per cent. of hard coal. The calorific value of frasil is about 10,800 B.TH.U. per lb., its ash content 15 per cent. to 20 per cent., and volatile matter 3 per cent. to 4 per cent. The coal-fed producers normally burn 10 lb. per sq. ft. per hour, can be overloaded 50 to 70 per cent., and then supply 35,400 cb. ft. per hour per producer. Experience shows that not more than 20 per cent. of sawdust should be present in the wood refuse used in the Riché producers, otherwise there occurs loss of partially-burnt fuel during slicing. The calorific value of gas made from the wood refuse is about 146 B.TH.U. per cb. ft. Through a gasholder of 17,700 cb. ft. capacity, gas is delivered at 2½ in. mercury pressure to the heating mains and the central station. The equipment of the latter comprises six 550-H.P. producer gas engines direct-coupled to D.C. generators. The four 1908 engines are two-cylinder, double-acting machines with cylinders 650 mm. diameter × 750 mm. stroke, speed 135 R.P.M., water-cooled pistons and piston-rod, L.T. ignition and control by variable mixture (compression constant at 170 lb.). Four-cylinder single-acting engines were installed in 1913, the cylinders being 560 × 700 mm., speed 190 R.P.M., pistons air-cooled, H.T. magneto ignition and control by variable compression (maximum 143 lb., the mixture being practically constant). Owing to risk of pre-ignition (particularly when using gas containing more than 17 per cent.—18 per cent. hydrogen) the maximum output of the 1908 engines is limited to 400 KW. The 1913 engines are much more elastic and will easily supply 10 per cent. overload (410 KW.) when operating on gas varying in calorific value from 100 to 160 B.TH.U. per cb. ft. No interruption in supply has been experienced during the five years the works have been in service, and no serious repair or replacement has yet been necessary. An 80-KW. reversible booster and 800-A.H. storage battery secure satisfactory operation in parallel and maintain the supply pressure constant within ± 3 per cent. Skilled manipulation is required to keep the calorific value of the gas between 135 and 170 B.TH.U. per cb. ft., despite wide variations in output; on the uniformity of gas consumption depends satisfactory performance.

During the past four years the fuel used per KW.-hour utilised has averaged from 1·80 to 2·01 lb. These figures assume 3 lb. of wood to produce as much gas as 1 lb. of coal, and assume that the gas engines consume 124 cb. ft. of gas per KW.-hour. The overall efficiency is about 12·7 per cent. (maximum = 14 per cent. in 1912), that of the producers averaging 68·7 per cent. The fuel consumption per effective KW.-hour is considerably (10 per cent.—30 per cent.) lower than that in large turbo-stations using 8,000 to 15,000-KW. turbo-generators, notwithstanding the lower load factor (25·4 per cent., as compared with 35 per cent. to 45 per cent. in the turbo-stations), and much smaller units in the present case. The overall thermal efficiency of the Interborough Rapid Transit station using 7,000 to 8,000-KW. reciprocating engines and exhaust turbines is 11·1 to 11·3 per cent., as compared with 12·7 to 14 per cent. using 400 to 500-KW. producer gas units. The cost of gas per 1,000 cb. ft. is estimated to be 2·75d. and of producing 1 KW.-hour (effective) to be 0·53d., made up as follows:—Fuel, 0·2; producers (wages, maintenance and waste, &c.), 0·14; gas engines—wages, 0·08; maintenance and repairs, 0·10; lubrication, &c., 0·01; total, 0·53d. per unit. Allowing for capital charges on £40 per KW., the total costs per KW.-hour and per 1,000 cb. ft. of gas are 0·8d. and 3·4d. respectively.

BUSINESS NOTES.

Consular Notes.—CHINA.—The Austrian Consul at Shanghai reports that a new Chinese electrical works, under British management, was erected during 1913 in the suburb of Nantao, near Shanghai; Chinese electrical works were also planned for Canton, Huchou (Chekiang), Tungchou (Kiangsu), &c. A new purely Chinese electric tramway undertaking was opened in August, 1913. The capital amounts to $20,000. The motors were supplied by the Siemens Electrical Co., the rails came from Germany, the cars and other installations were produced by Chinese firms, and the *personnel* also is Chinese. A similar Chinese undertaking was started at Peking at the end of 1913, with a capital of $3,000,000. The length of the line is intended to be 27 miles.

Later in his report the Consul gives the following figures of imports of electrical apparatus into Shanghai:—

	1911. Haikwan taels.	1912. Haikwan taels.
From Germany	601,847	547,255
„ Great Britain	369,620	429,199
„ Japan	243,521	249,387
„ United States	100,171	95,282
„ Belgium	64,220	67,453
„ Austria	7,791	26,236
„ Other countries	296,527	264,476
Total	1,683,697	1,680,288

Most of the firms who are engaged in this business with China have their own electrotechnical branches in the country, under the control of capable engineers. The German Siemens-Schuckert Werke have their own house in Shanghai (Siemens China Electrical Co.), which carries on an extensive business in the erection of electric lighting and power plant and in other directions. The following were the imports of telegraph material in the same years:—

	1911. Haikwan taels.	1912. Haikwan taels.
From Germany	62,998	102,519
„ Great Britain	133,093	82,957
„ Japan	97,007	62,657
„ Austria	7,198	6,731
„ Other countries	57,684	79,695
Total	357,980	334,559

CONGO.—The British Consul reports that since the date of his last annual report further progress with wireless telegraphy installation has been made, but atmospheric conditions in the district are unfavourable the air being highly charged with electricity. A new station is in process of construction at Kinshasa. Continued progress in the construction of telephone and telegraph lines is being made. Communication by telegraph is now established between Kasongo on the Kongolo Railway and Baraka on Lake Tanganjika.

RUSSIA.—The Austrian Consul at St. Petersburg reports that the past year was particularly favourable for the Russian electro-technical industry, which was especially assisted by the large orders given in consequence of the execution of the naval programme for the fitting up of vessels, the harbour works at Reval, the equipment of the State shipyards, &c. Moreover, the extension of several metallurgical and machine construction works and the establishment of new enterprises of this character brought important orders to the industry. Further, considerable activity was displayed in the erection of municipal lighting works in several provincial towns, as well as the erection of commercial and industrial plants. The three large undertakings in Russia are daughter companies of similarly named German works, the Allgemeine Elektrizitäts Gesellschaft, Siemens & Halske and Schuckert and Co., which all three control the Russischen Kabelwerke. At the end of 1913 negotiations towards amalgamation took place between the St. Petersburg works of Siemens & Halske and Schuckert & Co., whereby both should amalgamate as the Russische Siemens Schuckert Werke for high-tension plant, whilst Siemens should remain separate for low-tension plant. All the works, named together with the smaller works, "Volta," of Reval, Duflon and Konstantinovitch, of St. Petersburg, and others, showed satisfactory financial results, and are said to have been well supplied with orders at the beginning of the year. Increases of capital were effected in the case of the Allgemeine Elektrizitäts Gesellschaft, the Russian Wireless Telegraphy Co., and the St. Petersburg Lighting Co. of 1886.

ITALY.—The American Consul at Florence reports that following the example set by landowners in the Department of Emilia, some experiments have recently been made near Florence in ploughing by electricity. The advantages claimed for this system of power ploughing are:—(1) The small cost of equipment as compared with other mechanical systems of ploughing; (2) the lower cost of maintenance; (3) the need of a smaller number of labourers; (4) the fact that during stoppages from any cause the current may be cut off from the motors, thereby stopping at once the expense for power; (5) the availability of the surplus power from the motors and transformers for use in other work. The stationary apparatus drawing energy from some commercial electric line consists of transformers, motors from 25 to 50 H.P., motor-driven capstan, and hauling cable. The running apparatus is made up on a leading truck and wheeled ploughs. It is stated that 89 acres can be ploughed without shifting the stationary plant. At Gazzo Veronese the following estimates of the cost per acre of ploughing were made:—Ploughing with animals, 22s. to 24s.; steam power, 18s.; electric power, 12s. 6d. The ploughing was done to a depth of 35 to 40 cm. (13·78 to 15·75 in.), and the foregoing cost of electric ploughing is figured on the basis of 200 days' work per year with electric power at the rate of 1½d. per KW.-hour. In the same district for 100 days' work in the year with the price of electric power at 2d. per KW.-hour the comparative costs per acre of steam and electric ploughing were:—Steam ploughing, 21s.; electric ploughing, 14s. Other plants in the same district are said to have reduced the cost of electric ploughing to 10s. per acre.

Near Piacenza on a 2-acre tract the expense for ploughing to a depth of 45 to 50 centimetres (17·72 to 19·68 in.) with electric power was 16s. 8d. per acre. The ploughing was somewhat deeper, the cost of electric current was 2½d. per KW.-hour, and the land was cut by a highway running through it.

Calculations made at Reggio Emilia on 741 acres ploughed by electric power gave the following results:—

Capital invested:			
8 kilometres of line, 10,000 volts	£600	0	0
2 sets of motors and transformers, 50 H.P. each ...	415	0	0
2 capstans, platform ploughs, &c.	710	0	0
Total	£1,725	0	0
Operating expenses:			
13 per cent. of amount invested in line	£78	0	0
15 per cent. of amount invested in motors, &c. ...	62	0	0
20 per cent. of amount invested in ploughs, &c ...	142	0	0
Cost of current, 118,656 H.P.-hours	400	0	0
Labour for operation of motors and transformers, 2 men, 100 days	41	5	0
Labour for capstans and ploughs, 4 men, 200 days	133	0	0
Oil and lubricants for the motors	8	6	8
Oil and lubricants for the capstan and cable ...	6	5	0
Labour insurance	4	3	4
Superintendence	25	0	0
Total	£900	0	0
Electricity consumed for 741 acres, KW.-hours	30,000		
Loss in transmission and transforming, 10 per cent., KW.-hours	3,000		
Loss in energy by motors running without load... ...	2,100		
Total (equal to 47,736 H.P.-hours) KW.-hours ...	35,100		
Energy generated at cost of $1,920, H.P.-hours	118,656		
Used in ploughing, H.P.-hours	47,736		
Balance, H.P.-hours	70,920		

The balance of 70,920 H.P.-hours is available for use in other agricultural work, pumping water, running a mill, thrashing, &c. For other systems (those using a moving engine) of ploughing a similar parcel of land figured on the same basis the costs as calculated are: Ploughing with steam power, £908; gas engine, £910; oil burning engine, £893. The cost of fuel in this district is approximately as follows:—Coal, per metric ton, 50s.; wood, per quintal (220 lb.), 3s. 4d.; gasoline, per 5-gallon tin, 7s. 6d.; kerosene, per quintal, 29s. 2d.

Catalogues and Lists.—FORTUNA MACHINE CO., LTD., Deacon Street, Leicester.—Illustrated descriptive circular relating to their new "Fortuna" power hack saw with patent Universal vice, driven either by belt or by electric motor.

MR. P. W. RANDS, Caxton House, Westminster, London, S.W.—Publications giving prices and particulars of electric fans, also of various electrical plant and apparatus in stock.

MESSRS. FALK, STADELMANN & CO., LTD., 83-87, Farringdon Road, London, E.C.—Supplementary price list (No. 385) giving illustrated particulars and prices of "Antarctic" electric motor fans for table and wall service, also porthole type, and special ship and railway carriage types. Leaflet 189 gives prices, &c., of "Farringdon" H.V. flat tumber switches.

MESSRS. ADNIL ELECTRIC CO., LTD., Adnil Building, Artillery Lane, London, E.C.—Eight-page illustrated price list of their semi-indirect lighting fittings.

THE ELECTRICAL ENGINEERING AND EQUIPMENT CO., LTD.—109-111, New Oxford Street, London, W.C.—Illustrated list I.F.4 contains particulars and prices of the "Indra" electric lighting fittings suitable for either one-watt or half-watt lamps. One of the pictures shows a night view of a large modern office building, where the Indra system of illumination is employed, some 250 fittings being installed.

THE WALSALL ELECTRICAL CO., LTD., 57, Bridge Street, Walsall.—Supplementary catalogue giving clearly printed prices and illustrations of a number of their manufactures, including the Walsall minimum cut-out and the Walsall 1914 auto cut-in and cut-out. A further leaflet gives net prices of meters. During May the firm turned out over 5,000 meters, about one-fifth of the total turnover of last year. Prices have been considerably reduced owing to great strides made in the meter department.

MESSRS. DONOVAN & CO., 47, Cornwall Street, Birmingham.—New price list of electric desk and wall fans, Flicker knife switches, ironclad switchgear for mills and collieries, and cast-iron water-tight lighting fittings.

THE LENNOX FOUNDRY CO., LTD., Tantiron Foundry, Glenville Grove, New Cross, S.E.—Fifty-six-page catalogue of "Tantiron" specialities. The non-corrosive qualities and physical properties of "Tantiron" are shown in tabulated form, and plant and fittings made of this acid-resisting alloy, such as cocks, valves, blowers, ejectors, pipes, connections, pumps, &c., are well illustrated.

MESSRS. SANDYCROFT, LTD., Sandycroft, near Chester.—Catalogue of over 160 pages. The first few pages are occupied by specification and other matter describing their Cascade induction motors, excellent half-tone pictures appearing of complete motors and their parts. The remainder of the book consists of very fully detailed tables of prices, weights, &c., of three-phase single-speed Cascade motors (type H.V.1 without slip-rings) and accessories.

MESSRS. SIEMENS BROS. & CO., LTD., Woolwich.—Pamphlet A550 (52 pages), dealing with their quenched spark system of wireless telegraphy for ships. The system is now installed on more than 100 British vessels. The pamphlet contains an extract of all the important recommendations regarding wireless telegraphy by the recent Committee for Safety of Life at Sea.

MESSRS. J. & G. ODHAMS, 206 and 207, Upper Thames Street, London, E.C.—Abridged illustrated price list (20 pages) of electrical goods, including bells and bell accessories, magneto machines, ampholders, switches, conduits, fittings, lamps and cooking apparatus.

MESSRS. GEO. M'CARTNEY & CO., Burnside Works, Cumnock, N.B.—Leaflet describing the "Orb" combined switch and fuse panel (mining type).

MESSRS. CROMPTON & CO., LTD., Chelmsford.—Illustrated price list (536A) of searchlight projectors (commercial patterns). Dimensions and weights are given.

MESSRS. LESTER BETTS & CO., LTD., 9, London Street, E.C.—Bulletin No. 3 giving descriptions and prices of a variety of electrical manufactures.

MR. ROBT. H. LASCH, Carburton Street, Portland Road, London, W.—Illustrated price list of the "Excelsior" portable vice and stand for conduit work.

Book Notices.—"*Journal* of the Institution of Electrical Engineers." Vol. 52, No. 235. June 1st. London: E. and F. N. Spon, Ltd. Price 3s. 6d.—This issue contains papers on "Alternating Electromotive Forces in Parallel," by A. E. Clayton; and "Static Transformers for the Simultaneous Changing of Frequency and Pressure of Alternating Currents," by A. M. Taylor.

"Electric Furnaces for Iron and Steel." By D. A. Lyon and R. M. Keeney. Washington: Government Printing Office.

"Picture Play Photography." By H. M. Lomas. London: Ganes, Ltd. Price 5s.

"Konstruktion und Prüfung der Elektrizitätszähler." By A. Königswerther. Leipzig: Dr. Max Gänecke. Price M. 16.

"Les Courants Vagabonds, L'Electrolyse et les Perturbations causées par l'Induction et les Courants Pulsatoires." By A. Payot and A. T. d'Altoff. Paris: Dunod & Pinat. Price 1 fr. 25.

We have received from Mr. H. P. Wiggins a reprint of a paper read before the Optical Society, in which an interesting account of the mining, preparation and uses of mica is given. We note that owing to the peculiarities of the mineral, the cut mica that reaches the market is only $\frac{1}{20}$th to $\frac{1}{100}$th part of the mica mined, and not more than $\frac{1}{5000}$th of the rock excavated in mining.

For Sale.—The Corporation of Londonderry has for disposal, by tender, 192 double-carbon and 12 single-carbon arc lamps and accessories. Particulars are given in our advertisement pages.

Bankruptcy Proceedings.—Leonard James Aron, 7, Harpur Street, Bloomsbury, electrical engineer.—Under a receiving order made in this case, the first meeting of creditors was held on June 3rd at the London Bankruptcy Court. The receiving order was made on the petition of Capt. Clarence Wiener, who tendered a proof of debt for £653. Mr. W. G. Williams, Official Receiver, reported that it appeared from the debtor's statements that in 1897 he became connected with a business carried on by his uncle, which was in the following year converted into the Aron Electricity Meter, Ltd. In 1901 he entered into the employment of Vickers, Son & Maxim, and subsequently into that of the General Electric Co., Ltd., of Birmingham. In 1908 he re-joined Aron Electricity Meter, Ltd., who subsequently financed him to some extent in getting out certain electric clock patents. The debtor was also financed by a Mr. C. E. Harrison, an electric clock-case maker, and in August, 1911, he entered into partnership with that gentleman to combine the two businesses. They traded as the British Electric Time Co. until the partnership was dissolved in November, 1911. During the next few months the debtor traded alone, but in March, 1912, he met the petitioning creditor, and in the following month the "X.L. Electric Co." was formed, with registered offices at Waldorf House, Aldwych, W.C., and a nominal capital of £20,000. Capt. Wiener was to act as managing director, and the debtor as director and advisory engineer. The debtor, in consideration for the transfer of his interests to the company, was to receive 10,000 shares, of which Capt. Wiener was to have 5,000. The other 10,000 shares were offered for subscription, but only a small proportion were taken up by the public. Disputes arose between Capt. Wiener and the debtor in December, 1912, culminating in the present bankruptcy proceedings. No accounts had been lodged, but the debtor roughly estimated his liabilities at £2,500, and had no assets of substantial value. He attributed his insolvency to the creation of debenture bonds by Capt. Wiener over "X.L. Electric Co." in October, 1912. In the absence of a quorum the case was left with the Official Receiver to be wound up in bankruptcy.

Private Arrangement.—G. Braulik, electrical engineer, 8, Lambeth Hill, Queen Victoria Street, London, E.C.—A largely attended meeting of the creditors of the above was held on Tuesday, at the Cannon Street Hotel, E.C., when a statement of affairs was presented showing the position as at April 24th last. The statement disclosed ranking liabilities of £11,914, of which £7,551 was due to trade creditors, and £4,363 to Mrs. Braulik. The assets were estimated to realise £11,766, from which had to be deducted £232 for preferential claims, leaving net assets of £11,534, or a deficiency of £380. The assets were as follows:—Cash at bank, £17; cash in hand, £18; book debts, £3,656; fixtures, fittings and furniture, £75; and stock, valued on the basis of a going concern, at £8,000. Mr. Houston, of Messrs. Corfield & Cripwell, accountants, of Finsbury Pavement, E.C., said it would be remembered that a conference of the creditors was held on April 30th. According to the statement of affairs then submitted, which showed the position as December 31st last, the liabilities amounted to £15,183, and the assets were valued at £21,604. The assets, however, then consisted of book debts, £8,930; lease of premises, £375; investments, £1,000; while the stock was then valued at £11,105. At the conference of the creditors it was decided to accept a composition of 10s. in the £. It had been stated that Mrs. Braulik was a secured creditor for £2,500, and also an unsecured creditor for £1,800. If an assignment was agreed to, however, Mrs. Braulik would withdraw her claim until the creditors had received 10s. in the £. A very large number of the creditors had already agreed to the offer. Mr. Houston said that the present statement showed that the estate was practically solvent, but they had to consider what would happen if bankruptcy took place. At a forced realisation the stock would not realise anything like the amount set down upon it. The debtor had refused to sign the deed of assignment when it was presented to him for signature, as another firm in London were said to have issued a circular saying that they were the agents for a firm in Germany for which the debtor had always acted. If that agency had been taken away from the debtor, he would have lost a very large slice of his business, and would not have been able to trade with very great success. The firm in question were communicated with, and a reply had been received from them stating that the debtor was still their agent, and that the agency to the other firm did not exist. In answer to questions, it was stated that the debtor's offer of 10s. in the £ still held good; and, further, Mrs. Braulik would withdraw her claim until the creditors had received the amount of the composition. Owing to a threatening creditor a deed of assignment had already been executed, with Mr. G. E. Corfield as trustee. After a lengthy discussion, the creditors decided that the offer made should be accepted, and they also confirmed the deed already executed. A committee of the principal creditors was also elected.

Trade Announcement.—The works and offices of Messrs. J. H. Tucker & Co., of Birmingham, will be closed all day on Saturday, 20th inst., the occasion being the annual works' trip to Blackpool.

Liquidations.—Colne and Trawden Light Railways Co.—A meeting of creditors will be held on June 12th at 16, Great George Street, S.W.

Ludw. Loewe & Co., Ltd.—A meeting is to be held in Berlin on July 13th, to hear an account of the winding-up. Mr. G. W. P. Goodchild, liquidator.

Lamp Manufacture.—Poland.—The Zircon Co. is the name of a new undertaking which has lately been formed in Warsaw, with a capital of £63,250, to carry on the manufacture of lamps and other electrical appliances.

LIGHTING and POWER NOTES.

Bath.—The Corporation and the Diesel Engine Co. have arrived at a settlement in regard to the Diesel engine plant supplied by the latter, under which the Corporation pays £1,575 in discharge of all its liabilities under the contract and retains the engine. The original contract price was £5,451, but various deductions were made in view of the engine not fulfilling its guarantees. The engineer is now authorised to spend £50 with a view to improving the efficiency of the engine.

Bexley.—L.G.B. Inquiry.—An inquiry was held last week into the application of the U.D.C. for a loan of £8,000 for electricity purposes, including £2,500 for mains, services and transformers, and £5,500 for extensions, to plant, the latter being the alternative to taking a bulk supply from Woolwich. The application was supported by the Traders' Association.

Blackburn.—Street Lighting.—The T.C. has authorised the preparation of a scheme for automatic street lighting.

Castlerahan (Co. Cavan).—Prov. Order.—The L.G.B. has granted the application of the R.D.C. for powers for lighting the town of Virginia with electricity.

Chester.—Hydro-Electric Results.—Mr. Britton, the city electrical engineer, informs us that the hydro-electric works have been in operation 23 weeks up to March 25th last. During this period 736,310 units were generated, 15·5 per cent. being used for excitation, sewage pumping, works lighting, distribution, &c., leaving 639,427 units supplied to consumers. Running and maintenance cost, rents, rates and establishment charges amounted to £299, or ·112d. per unit; capital charges were £554, or ·208d. per unit; the total cost of energy supplied from the plant being ·32d. per unit sold.

Christchurch.—Workhouse Lighting.—The B. of G. has received L.G.B. sanction to a loan of £680, for the purpose of lighting the workhouse, infirmary, nurses' home and cottage homes with electricity.

Cleckheaton.—Proposed Extensions.—The Electricity Committee has decided to install a mixed-pressure turbine, driving a 400-kw. d.c. generator, in conjunction with the surface condenser, and to extend the engine room. The Committee recommended the installation of two Babcock & Wilcox water-tube boilers behind the destructors—doing away with the two small Lancashire boilers—the new boilers to be so arranged that they could be used solely for destructor purposes or as coal-fired boilers. The Committee also suggested the construction of a 600,000-gallon reservoir to supply the works, and the installation of a water filter and a grease separator. The suggestions were approved by the T.C.

Colchester.—Year's Working.—The revenue of the electricity department for the past year was £17,809, and the gross profit £7,671, and after meeting financial charges, £5,737, and writing off £1,273 on prepayment installations, meters and arc lamps, a balance of £661 remained, as against £591 in the previous year. The units sold amounted to 1,623,526, an increase of 68,000. For the first time since the institution of prepayment installations the receipts from them have exceeded the total expenditure, which includes £748 written off suspense account; 72,488 units were supplied on this basis, and the surplus was £11.

Continental Notes.—Norway.—The Shenkjär Mill and Electrical Works have recently purchased the water rights of three waterfalls in the neighbourhood of the town of the same name, which will be capable of producing 3,000 e.h.p.

The municipal authorities of Kristiansand have decided to purchase the existing electrical works and the water-rights of a number of waterfalls in the River Nidelven for £163,000, supplementing a purchase of several other falls, which was made in 1912. When regulated, the river will be able to supply up to 75,000 e.h.p., delivered at the town. The cost of harnessing the falls and of the erection of electrical plant and cables, &c., is estimated at £1,111,000. Kristiansand will have a larger amount of power at its disposal than any other Norwegian town.

Austria.—The Austrian Union for Chemical and Metallurgical Products, of Aussig, and Messrs. Kolben & Co., of Prague, are interested in a scheme for the utilisation of the water-power of the River Elbe, between Aussig and Lobositz, in the generation of electricity.

Spain.—The Sociedad Electricas Reunidas de Zaragoza proposes to erect a new electricity generating station of 4,000 h.p. in the town of Saragossa.

Clevedon (Somerset).—Prov. Order.—The Clevedon and Portishead Electric Supply Co. has intimated its willingness to waive the agreement with the Council respecting the lighting of the district on the understanding that the Council will not press for a revocation of the prov. order until November 1st next; the Council has accepted the offer.

Dewsbury.—Proposed Extensions.—The Electricity and Tramways Committee is negotiating with the Gas and Water Committee for the purchase of property adjoining the Bradford Road electricity works, in order to extend the plant to supply the proposed Mitchell Laithes sewage works.

Dover.—The T.C. has entered into an agreement whereby the War Office will take a minimum supply of 30,000 units per annum at 3¾d. per unit, and beyond that at 3d. per unit; current for power is to cost 2¼d. per unit.

Dundee.—Year's Working.—The revenue of the Corporation electricity department for the past year showed an increase of £5,408 over the previous year, equal to 20 per cent. The net profit was £5,150. The reduction of the charge for heating from 1½d. per unit for the first 100 units, and ¾d. per unit after, to ¾d. per unit, has been recommended. This applies also to the guaranteed lighting consumers.

Durham.—Overhead Wires.—The County of Durham E.P.D. Co. has applied to the B. of T. for permission to use overhead wires in the borough for the supply of electricity to the Corporation Sewage Works, at a pressure of 480 volts.

Edinburgh.—Street Lighting.—The E.L. Committee has agreed to recommend the reduction of the cost per arc lamp for street lighting from £9 to £7 10s. per lamp.

Farnworth.—Proposed Loan.—In regard to the application of the U.D.C. for loans of £1,900 for transformers, and £1,000 for mains, the L.G.B. has asked what need the Council had for the extra plant, and also for a detailed statement of the sums required. The Board expressed its willingness to entertain the application in regard to cables, and the loan for this purpose has been increased to £1,500, for three years.

Frodsham.—Sewage Pumping.—The Water Committee has been recommended to install electricity in place of gas for pumping purposes, at a capital outlay of £155 for motors, &c., with £128 a year for current, against £195 for gas. A Committee has been formed to report on the matter.

Grays.—Year's Working.—The output of the U.D.C.'s electricity department for the past year was 256,447 units, an increase of 46,725 on the previous year. The gross profit was £1,977 and the net profit £287. Owing to the increased load it is expected that new plant will have to be installed next year.

Hastings.—Year's Working.—The income of the Corporation electricity department for the past year amounted to £25,338, an increase of £3,011 on the previous year. The expenditure was £12,468, an increase of £1,799. The net profit was £1,297, an increase of £740. The energy sold amounted to 1,284,501 units, the consumers numbering 1,706.

Hereford.—Proposed Loan.—The T.C. has applied to the L.G.B. for sanction to a loan of £1,030, for electricity purposes.

Horwich.—Proposed E.L.—The South Lancashire Tramways Co. having stated that it has no powers to supply electricity in the district, the U.D.C. has decided to allow the Bolton T.C. to submit terms.

Huddersfield.—Proposed Bulk Supply.—The Electricity Committee has agreed to receive a deputation from the Golcar U.D.C. relative to the latter's inquiries as to a supply of electricity in bulk.

Hythe.—Electricity and Water Mains.—In presenting an estimate of £900 for the substitution of cast-iron for steel water-mains, the borough surveyor stated that the steel mains had only been laid four years, and there was no doubt that the leakages, 39 in number, were caused by electrical action. The Waterworks Committee proposes to engage an electrical engineer to report on the matter; the town clerk thought that the responsibility for the damage rested with the Electricity Co.

Hull.—Asylum Lighting.—The T.C. has sanctioned the introduction of electric lighting at the Willerby Asylum.

India.—Messrs. Burn & Co., Ltd., of Calcutta, have been granted a concession for the utilisation of the rivers in Sikkim, for the generation of electricity.—*Indian and Eastern Engineer.*

Leigh.—Year's Working.—The total income for the past year of the electricity department amounted to £10,690; the gross profit to £5,026; and the surplus, after meeting all charges, was £1,154. The units sold were 1,325,492, an increase of 239,195 for the year, during which generation and distribution charges fell from 1·059d. to 1·024d. per unit, and total charges from 1·82d. to 1·72d. per unit, despite an increase in cost of fuel.

Lincoln.—Year's Working.—The gross profit on the Corporation electricity department for the past year was £6,792, an increase of £177 compared with the previous year. The net profit was £2,715, of which £1,500 has been placed to the relief of rates, and £1,040 to the depreciation account. The energy sold, 2,105,000 units, represents a small decrease compared with the previous year, which is accompanied by a slight increase in working costs.

Lisnaskea.—L.G.B. Inquiry.—Dr. J. F. M'Carthy held an inquiry last week into the application of the R.D.C. for powers to light the streets of the town with electricity. The proposed area includes Lisoniel, Castlebalfour, Drumbane, Killygullen and Barnhill.

Little Hulton.—Proposed Street Lighting.—The D.C. has asked the Earl of Ellesmere to quote a sum for lighting Wharton Lane by electricity from the Wharton Hall colliery plant.

London.—Poplar.—Annual Report.—Mr. J. Horace Bowden, the borough electrical engineer, in his annual report on the electricity undertaking, shows a net profit for the last year of £8,010. The working costs were 0·55d. per unit sold, which constitutes a record for the metropolitan area. The average price obtained was 0·97d. per unit, and if the supply to Stepney is deducted, the figure for energy sold in the Poplar area is 1·11d. The output of 17 million units is the largest figure yet published in connection with a metropolitan municipal undertaking.

Luton.—Workhouse Lighting.—The B. of G. has decided not to install a separate E.L. installation at the workhouse, as the running cost would be more than the Board at present pays for the supply of current.

Lytham.—Proposed Loan.—The L.G.B. has informed the Council that it is unable to deal further with the Council's application for sanction to a loan for E.L. purposes until the St. Anne's U.D.C. has obtained powers to give the proposed supply to Lytham.

Maybole.—Proposed E.L.—The T.C. has granted the application of Messrs. Purvis, of Edinburgh, to send a representative to Maybole to discuss the question of a supply of electricity for the town.

Morley.—Year's Working.—During the past year the units sold by the Corporation electricity department numbered 214,337, against 180,086 in the previous year. The revenue was £3,739, against £3,476, and the expenditure £2,229, against £2,152.

Newbiggin.—Overhead Wires.—The Newcastle-on-Tyne E.S. Co. has asked the consent of the B. of T. to the erection of a 20,000-volt overhead electric line, from North Seaton to Newbiggin Colliery sub-station.

Newport (Mon.).—Proposed Free Wiring.—The Electricity Committee has instructed the borough electrical engineer and the general manager to consider the question of undertaking free wiring in workmen's houses.

New Zealand.—The municipal authorities of Oamaru have decided to expend £30,000 on an electricity undertaking for the town.

The Napier B.C. has decided to obtain a loan of £7,200 for the completion of the E.L. and tramway extensions now in hand, and £7,700 for further extensions to the present systems.—*Tenders.*

Norwood Green (Yorks.).—Street Lighting.—The Halifax R.D.C. has approved of the resolution of the P.C. to obtain terms for electric street lighting, including erection of lamps, from the Yorkshire E.P. Co. and Halifax Corporation.

Pinner.—E.L. Scheme.—The Colne Valley E.S. Co. has informed the Hendon R.D.C. that it is about to lay cables in the Pinner area, and that the supply should be available by next November.

Plymouth.—Supply to Tramways.—The Mayor and chairman of the Finance Committee, to whom the matter was referred, have decided that the charge shall be 1¾d. per unit up to 250,000 units per annum, and 1½d. per unit above that amount, as from April 1st, 1914, for a supply of electricity to the Tramways Committee.

Radcliffe.—Overhead Wires.—The U.D.C. has applied to the B. of T. for consent to use overhead wires in the district.

Skelton and Brotton.—E.L. Scheme.—The U.D.C. has received B. of T. sanction to the use of overhead wires for the proposed E.L. scheme, provided all the regulations are complied with. The Council decided that the work should be completed within four months from the commencement, also to ask the Gas Co. to light the streets until electricity is available, and to advertise for tenders for the plant.

South Africa.—The Wellington (Cape Province) E.L. installation, which cost £10,000, was inaugurated on May 17th by Mr. Malan, Minister of Mines and Education.

One of the few isolated plants in use in Johannesburg, which supplied the Standard Building and Standard Theatre, failed last month, and the theatre was closed in consequence. Our correspondent considers that as a result such plants will be discarded in the future.

Stalybridge.—Proposed Bulk Supply.—The chairman of the Generating Station Committee of the Joint Board and the engineer have been requested to draft terms upon which the Board would supply electricity in bulk to the Saddleworth U.D.C.

Stockport.—Proposed E.L. Extension.—The borough electrical engineer has been instructed to canvass the residents at Reddish with a view to ascertaining the number of possible consumers of electricity, and to prepare an estimate of the cost of providing a supply.

St. Helens.—Year's Working.—The sales of energy of the Corporation electricity department for the past year amounted to 5,036,412 units, an increase of 146,000 units over the previous year. The revenue was £28,557, an increase of £1,192, and working expenses amounted to £14,534, an increase of £1,190, of which £783 represented the increased cost of fuel. The total cost of production was ·57d. per unit, an increase of ·02d. The net profit, which has been carried to the reserve fund, was £1,099, compared with £1,629

Swindon.—PROPOSED LOAN.—The T.C. has approved of a proposal to raise a loan of £7,000 for the development of the electricity undertaking. It is estimated that the cost of providing a supply to the Imperial Tobacco Co.'s new factory will be £4,820.

Tasmania.—In a report on the proposals for the extension of the Launceston electricity works, Mr. R. J. Strike, the city electrical engineer, suggests the installation of a battery and booster of three times the capacity of the present one, and, when required, a 300-KW. motor-generator. He recommends that the capacity of the station be increased by water-power from the South Esk, and that two units (one spare) of 2,500 E.H.P., and, later, others of 5,000 E.H.P. each, be installed. The ultimate maximum load is estimated at from 18,000 to 22,000 E.H.P., and immediate action in the matter is urged.—*Tenders.*

Thirsk.—STREET LIGHTING.—The P.C. has decided to invite tenders from the local gas and E.L. companies for street lighting in the parish.

Torpoint.—PROPOSED E.L.—Mr. J. A. Pearce, of Devonport, has informed the U.D.C. that certain developments having arisen, the proposed Electricity Co. will now be formed without delay, and the Council has decided to consider the question at a special meeting.

Truro.—PROPOSED NEW GENERATING STATION.—The T.C. has applied to the B. of T. for permission to erect an electricity generating station in Newham Road.

Tunbridge Wells.—ANNUAL REPORT.—The report of Mr. R. N. Torpy, the borough electrical engineer, upon the operation of the electricity undertaking for the past year, states that the net profit has increased from £1,111 to £2,235. The number of units sold has increased by 168,000, with a reduction in total costs of £115. The gross profit has increased from 7·72 per cent. to 8·9 per cent. on the average capital expended, although reductions in price amounting to nearly £600 were made last year. The actual revenue increased by £1,153, compared with the preceding year. The increase in 30-watt lamps connected was 16,373, of which 11,884 represent power and heating.

LOAN SANCTION.—The T.C. has received L.G.B. consent to a loan of £3,100 for electricity purposes, including mains, £2,500; services, £200; transformers, £200; and sub-station pillars, £200.

In accordance with the suggestion of the L.G.B., the Council has decided to apply for a prov. order to supply electricity within a radius of three miles from Holy Trinity Church, in the areas of the Ticehurst, Tonbridge and Sevenoaks R.D.Cs.

U.S.A.—In a recent issue of the *Electrical World*, it was pointed out that the total output of the New York Edison Co. for electric vehicle charging is in the neighbourhood of 7,000,000 KW.-hours a year.

Walthamstow.—PROPOSED LOAN.—The U.D.C. has applied to the L.G.B. for sanction to the borrowing of £2,055, for an electricity main to supply the Billet Road district with a view to meeting the requirements of factories, &c.

Warrington.—PROV. ORDER.—The Electricity Committee has decided to apply for a prov. order to supply electricity to Stockton Heath, Latchford Without, Thelwall, Grappenhall, Lower Walton, Higher Walton and Appleton. The T.C. is seeking the consent of the Lancashire E.P. Co. to supply electricity in Penketh and Great Sankey.

Wimbledon.—LOAN SANCTION, &C.—Messrs. James Carter & Co. have agreed to take a supply of electricity from the B.C. at 1d. per unit for three years, with a minimum consumption of 100,000 units per annum.

The B.C. has received L.G.B. sanction to the borrowing of £8,087 for additional plant at the electricity works.

Wolverhampton.—LOAN SANCTION.—The L.G.B. has sanctioned the borrowing by the T.C. of £28,000 and £2,500, for extensions at Commercial Road electricity generating station.

Worcester.—PROPOSED LOAN.—The Electricity Committee has recommended the T.C. to apply to the L.G.B. for a loan of £5,250, including mains, £4,000; transformers, £750; and sub-station equipment, £500; and also for £1,973, for expenditure incurred by the increased demand for current.

Worthing.—HALF-WATT LAMPS.—The T.C. has decided to replace the 28 850-C.P. arc lamps on the Marine Parade with independently-connected 1,000-C.P. half-watt lamps, at an estimated cost of £120. This, it is estimated, will result in an annual saving of £32 14s., while the illumination will be increased by 17 per cent. The chairman of the Highways Committee remarked that half-watt lamps would, no doubt, be gradually extended into the other streets of the town.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—YEAR'S WORKING.—The returns of the Corporation tramways department for the past year show that the passengers carried numbered 20,966,394, and the car-mileage amounted to 1,832,587 miles. The total revenue was £85,264, an increase of £5,113. A proposal has been made for the Corporation to take over or manage the Suburban Co.'s tramway system.

Bournemouth.—The T.C. has decided to apply to the B. of T. for permission to double the tramway track on Richmond Hill, and to obtain a loan to cover the cost. The general manager has been instructed to prepare specifications and obtain tenders for the work.

Bradford.—The Tramways Committee has decided, after consideration of the report of the general manager on fares and stages, that the present time is not opportune for further reducing fares, but that the general manager be asked to prepare a more definite scheme for increasing the length of stages.

The Committee has decided to support the application of the Bingley U.D.C. to the B. of T. for additional borrowing powers in connection with the Bingley tramways. The Committee has also approved an estimate of £15,848 by the city engineer for the continuation of the tramway from Ann Street to Micklethwaite Lane.

The Committee has decided to proceed with the extension of the tramway depôt and workshops, at an estimated cost of £54,000.

Burnley.—YEAR'S WORKING.—The past year's working of the Corporation tramways resulted in total receipts amounting to £88,316; the working expenses amounted to £62,948; and of the balance, interest and sinking fund charges absorbed £14,667; rent of lines, £1,941; income-tax, £1,072; and the borough fund, £7,687. The passengers carried numbered 17,669,000. The general manager, Mr. Mozley, refers to the increased expenditure, which exceeded the increased revenue by over £5,000, but much of this was due to special circumstances.

Canada.—The Elbow River Power and Development Co. is to commence this autumn the building of an electric railway to connect Calgary with Springbank and Jumping Pond. The line is to be about 40 miles long, and will be known as the Elbow Suburban Railway.—*Canadian Engineer.*

Colchester.—YEAR'S WORKING.—The revenue of the Corporation tramways for the past year amounted to £10,966, and the working expenses to £8,812, the debit balance, after meeting financial charges, being £2,333, as compared with a deficit of £1,964 in the previous year. The car-miles run, 324,622, were a slight increase on 1912-13; the tickets issued were 1¾ millions, including 381,000 return tickets.

Continental Notes.—SWEDEN.—A large electric locomotive is being erected at Kiiruna for the purpose of undergoing practical tests. The engine is equipped with two electric motors, which have a total rating of 1,700 H.P.

ITALY.—The Turin-Cirié-Lanzo Railway has decided to convert its existing line, and also the Lanzo-Cirié branch now under construction, to electric traction. The work is to be carried out by Messrs. Siemens-Schuckert, and the system adopted is continuous current at 1,500 volts. Current will be supplied by the Società Elettricita Alta Italia. The line has an extent of 45 km.

The Società Brioschi, of Milan, has presented its scheme for the construction of an electric railway from Borgo San Donnino to Salsomaggiore. It forms the first section of a main line from Borgo San Donnino to Borgo Taro, for which the society is now maturing its plans. The present line is to be 9½ km. long. The locomotives will have two 100-H.P. D.C. motors, and a transformer station will be installed to convert the A.C. at 120,000 volts, which will be utilised.

Doncaster.—PROPOSED EXTENSIONS.—The T.C. is to consider the proposed construction of a tramway from Sunny Bar to High Street.

New Zealand.—The Wanganui B.C. has decided to extend its overhead electric tramway system, at a cost of £21,000.—*Tenders.*

South Africa.—The overhead equipment for the Germiston railless traction scheme is now completed, and two 500-KW. Peebles motor-converters have been installed and tested. Some delay is expected in connection with the cars. The Germiston scheme is the second one to be adopted in South Africa, the first one being at Boksburg, a neighbouring town.

St. Helens.—RAILLESS TRACTION.—The Parliamentary Committee has instructed the Tramways Sub-Committee to inquire as to the running of railless trolley cars and motor-'buses.

The Tramways Co. has requested the T.C. to extend the lease of tramways for a further period of 21 years.

Wolverhampton.—YEAR'S WORKING.—The annual accounts of the Corporation tramways department for the past year show that the total receipts amounted to £56,444, and the gross profit to £24,078, which has been disposed of as follows:—Interest, £6,854; repayment of loans, £5,285; renewals fund, £3,716; additions and improvements fund, £2,848; and rate relief, £5,554. The reserve and renewals fund now stands at £54,864. Receipts per car-mile were 11·333d., and the working costs increased from 6·272d. in the previous year to 6·651d., due largely to the assessment of the undertaking being increased from £2,500 to £5,294. During the year 1,195,326 car-miles were run, and the passengers numbered 12,616,881.

York.—YEAR'S WORKING.—The working of the Corporation tramways department for the year ended March 31st last resulted in a net surplus of £2,523; the passengers carried numbered 5,946,143, against 5,008,398 in the previous year.

TELEGRAPH and TELEPHONE NOTES.

Guadaloupe.—The Colonial Government authorities have voted a sum of £8,320 for the establishment of a wireless telegraph station.

Wireless in the Pacific.—The Japanese Department of Communications has opened negotiations for the transmission of wireless messages through the Marconi wireless station in Honolulu, and plans have been prepared for the erection of a wireless station near Choshi, at a cost of about 400,000 yen.

Wireless Rescue.—In the disastrous collision which resulted in the loss of the *Empress of Ireland*, wireless telegraphy again rendered priceless assistance. The distress signal was immediately issued by the chief operator, Mr. R. Ferguson, and gained the attention of the station at Father Point, resulting in the instant dispatch of two steamships to the rescue, although only eight minutes elapsed between the collision and the stoppage of the dynamos by the inrushing water.

Wireless Research.—The report of the Committee on Wireless Telegraph Research, presided over by Lord Parker, was issued on Monday last. It recommends the appointment of a National Committee for Telegraphic Research, for the purpose of promoting the progress of scientific telegraphy and telephony, with the aid of a National Research Laboratory and a special scientific staff. The laboratory should be established at Teddington, in co-operation with the National Physical Laboratory, and the staff would carry on investigations, the results of which would be available for all departments of the public service.

The Committee, it is stated, should consist of 12 members, namely, two representing the Admiralty, two the Post Office, one the War Office, two appointed directly by the Treasury (not departmental officials), three appointed by the Treasury on the nomination of the Royal Society, one on the nomination of the Institution of Electrical Engineers, and the Director of the National Physical Laboratory, with a secretary of technical training and experience. The annual expenditure required is estimated at £4,800, of which £2,255 would be for the laboratory staff and £1,100 for honoraria to the National Committee. The cost of a mast and aerial, with buildings, and a laboratory covering 4,000 sq. ft., with equipment, is put at £7,300. For work to be commenced without delay, the Committee should have at disposal at least £4,000.

The Committee reports that valuable work is being done by the engineering department of the Post Office, but is hampered by lack of funds, and is necessarily directed primarily to the requirements of the service rather than to scientific progress in general. The same applies to the research work of the Admiralty and the War Office. Both the United States and Germany make liberal provision for experimental research in wireless telegraphy.

No member of the Committee will advise commercial firms on matters connected with the work of the Committee, except with the consent of the latter.

Wireless Telephony.—Reports from Paris state that further progress has been made by the French naval officers, Commander Colin and Lieut. Jeance, who have been carrying on experiments in wireless telephony for the past five years. Conversations have been very successfully and efficiently carried on over a distance of 150 miles.

It is understood that the inventors have succeeded in developing a transmitter which can be depended upon to maintain constancy of pitch, enabling accurate tuning to be effected. The apparatus is made by the Compagnie Générale de Radiotélégraphie.

Portsmouth.—On June 1st the transfer of the Corporation's telephone system to the Post Office took place. The purchase price was £35,000, and there were about 2,600 subscribers connected.

CONTRACTS OPEN and CLOSED.

OPEN.

Atherton.—June 24th. E.H.T. cable switchboard and transformers for the Electricity Department. Mr. C. T. Astbury, Resident Engineer.

Australia.—SYDNEY.—July 20th. Box compound, meters, maximum-demand indicators, arc lamp carbons, and straight-stem insulators, for the Council. Specifications for each section 10s. 6d., from City Electrical Engineer, Town Hall.

July 20th. H.T. insulators and feeder cables. Specifications (10s. 6d.) from the City Electrical Engineer, Town Hall.—*Australian Mining Standard.*

July 20th. Municipal Council. 33,000-volt insulators (Contract No. 278); two coal conveyors, motors, &c. (Contract No. 307). Copies of particulars can be seen at the Board of Trade Commercial Intelligence Department in London.

July 8th. N.S.W. Railways and Tramways Department. One battery booster set to Specification No. 453. Specification (2s. 6d.) from the Electrical Engineer's Office, 61, Hunter Street, Sydney.

HOBART.—July 20th. Telegraph and telephone material, for Postmaster-General. See "Official Notices" to-day.

PERTH.—August 5th. Copper wire and binders, for Postmaster-General. See "Official Notices" to-day.

August 5th. Telephone instruments and parts. Telegraph accumulators and power board, Kalgoorlie, for Postmaster-General. See "Official Notices" to-day.

August 12th. Cable, lead-covered and various, for Postmaster-General. See "Official Notices" to-day.

August 19th. Electric lamps and fittings, for Postmaster-General. See "Official Notices" to-day.

MELBOURNE.—July 28th. Testing apparatus for the P.M.G. See "Official Notices" to-day.

July 6th. Rotary converters and frequency changers, for Melbourne Suburban Railways. See "Official Notices" June 5th.

July 6th. Electrically-operated car-shed cranes for Melbourne Suburban Railways. See "Official Notices" to-day.

August 26th. Eight 50-ton, one 30-ton, and three 10-ton electric overhead travelling cranes for Victorian State Railways. Specification, &c., from Messrs. John Coates & Co., Ltd., 115, Victoria Street, S.W.

August 12th. Insulators, for Postmaster-General. See "Official Notices" to-day.

Austria.—June 30th. The Austrian State Railway authorities in Innsbruck are inviting tenders for an electric lighting installation at the West Railway Station in the town of Innsbruck.

Aylesbury.—July 6th. U.D.C. Lighting and power. Switchboard with connections, battery of accumulators, underground mains, including house services, conversion of existing lamp standards, &c. See "Official Notices" to-day.

Beckenham.—June 22nd. U.D.C. Evaporative condenser (500-KW. set). See "Official Notices" to-day.

Belgium.—July 18th. The municipal authorities of Nalinnes are inviting tenders for the concession for the supply of electrical energy for public and private lighting and power purposes in the town.

Bolton.—July 19th. Corporation. Converting plant, sub-station E.H.T. and H.T. switchgear. See "Official Notices" to-day.

Dartford.—June 15th. U.D.C. One 500-KW. high-pressure steam turbine, generator, condenser, &c. See "Official Notices" May 22nd.

June 17th. Installation of telephones and domestic bells, &c., at Orchard Hospital, for Metropolitan Asylums Board. See "Official Notices" June 5th.

Doncaster.—June 22nd. Light railway extensions for Corporation Tramway Department. Specification, &c. (10s., not returnable) from the Borough Engineer, 3, Priory Place.

Dublin.—June 25th. Corporation. Feed pump, tanks, pipework, &c. See "Official Notices" June 5th.

Eccles.—June 22nd. 5,000 tons of slack for the Electricity Department. Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft.

Exeter.—June 15th. Steam coal. Washed beans or peas, about 2,500 tons for six months, or about 4,800 tons for 12 months, for the Corporation Electricity Works. Mr. H. Lloyd Parry, Town Clerk.

France.—VIENNE.—June 24th. Supply of underground electric cables and wire, 500 plumbago crucibles, and 5,500 kilograms of minium and litharge. Particulars from the Manufacture d'Armes de Châtelherault.

Harrogate.—June 22nd. Corporation. Economiser, 288 pipes, for Electricity Department. See "Official Notices" May 29th.

Hereford.—E.L. installation, Holy Trinity Church; Rev. D. H. G. Sargent, Vicar.

Huddersfield.—22nd June. Electric light installation at Crosland Moor Institution. Mr. T. W. Armitage, Clerk to the Guardians, Union Offices, Ramsden Street.

Hull.—The City Council decided on the 4th inst. that the contract for the supply of electrical fittings in the new Guildhall be submitted to open competition.

Hungary.—FACSAD.—June 20th. Erection of a power station and distribution network for public and private lighting. Particulars of the Vozstehung der Gemeinde, Facsad, Komitat Szöreny, Hungary.

Leeds.—June 17th. Installation of electric lighting, bells and telephones at Grange Hospital. Apply to Architects' Section of the Education Department.

June 29th. Corporation. Air-cooled transformers. See "Official Notices" May 22nd.

London.—L.C.C.—June 23rd. 50, 100 or 150 complete trailer-cars, and equipment of 200 existing electric motor-cars with couplers and traction gear for drawing trailer-cars. See "Official Notices" May 29th.

June 30th. 150 sets plough collector gear. See "Official Notices" to-day.

BATTERSEA.—June 24th. B.C. Coal telpherage plant. See "Official Notices" May 29th.

ST. PANCRAS.—June 25th. B.C. Large water-tube boilers. See "Official Notices" June 5th.

H.M. OFFICE OF WORKS.—June 30th. Wiring public offices extension, Westminster, S.W. See "Official Notices" to-day.

Manchester.—June 26th. Corporation. Potential and current transformers, C.C. and A.C. motors, electricity meters, C.C. motor-starting switches and three-phase star-delta switches. See "Official Notices" to-day.

Morecambe.—June 25th. Corporation. 2,500 tons of coal or slack, for the Electricity Supply Department. See "Official Notices" May 29th.

New Zealand.—WELLINGTON.—July 27th. New Plymouth B.C. (2) Overhead wiring and permanent way (5 route miles). (3) Sub-station equipment (converting plant, battery, booster, switchboard, &c.). (4) Rolling stock (six complete cars) for electric tramways. Specifications from Mr. F. Black, Consulting Engineer, Wellington, or B. of T. Offices, London. Deposit (2) £4 4s.; (3) £2 2s.; (4) £2 2s.—*N. Z. Shipping and Commerce.*

AUCKLAND.—August 6th. Three 750-KW. D.C. mixed-pressure turbo-generators; one 1,500-KW. three-phase turbo-generator, including auxiliary plant and sub-station equipment. See "Official Notices" May 22nd.

Panama.—Particulars of material required by the Government of Panama for the construction of a telegraph and telephone system can be obtained at the Commercial Intelligence Branch of the Board of Trade, London, E.C.

Rhondda.—June 18th. U.D.C. Installation, 330 points, 360 lights, at Fever Hospital, Ystrad-Rhondda. See "Official Notices" to-day.

Salford.—June 15th. 24 car bodies, also trucks, motors, controllers, &c., for same. General Manager, Corporation Tramways, 32, Blackfriars Street.

Skelton and Brotton.—July 2nd. U.D.C. Overhead lines, underground cables, transformers, sub-station equipment, public lighting fittings. See "Official Notices" to-day.

South Africa.—Tramway material, estimated to cost £85,000, is shortly to be ordered by the Germiston (Transvaal) T.C. Particulars from the Town Clerk.—*B. and S. A. Export Gazette.*

Stalybridge.—June 27th. 12 months' supply of stores for the Joint Tramways and Electricity Board. Specifications and form of tender obtainable from Mr. R. Blackmore, Engineer-in-Chief, Generating Station, Stalybridge.

Stockton-on-Tees.—June 12th. Corporation. Supply of E.H.T. lead-covered paper cables. See "Official Notices" June 5th.

Stretford.—June 15th. Lighting battery, booster, switchboard, &c. Specifications (£1 1s.), from Mr. R. Rowland, Resident Engineer, Electricity Works, Chester Road.

Swansea.—June 25th. Corporation. Main generating station and sub-station. Extra H.T. and L.T. switchgear. See "Official Notices" June 5th.

Walthamstow.—June 12th. U.D.C. E.H.T. cable and stoneware conduits. See "Official Notices" June 5th.

Warrington.—July 3rd. Electric equipment, &c., for transporter bridge over the River Mersey, for Jos. Crosfield & Sons, Ltd. Drawings, &c. (£2 2s.) from Mr. W. H. Hunter, M.I.C.E., 42, Spring Gardens, Manchester.

CLOSED.

Australia.—Department of Home Affairs :—

E.L. installation at Postal Stores, £244.—Hayes & Eggers, Ltd.
Sydney Tramways Department.—Four D.C. motor-generators, Spec. No. 446. —Shaw Wireless, Ltd.—*Australian Mining Standard.*
P.M.G.'s Department.—4,000 Vedopri link insulators, £305.—Laing, Wharton, Ltd.—*Tenders.*

SYDNEY.—The Electricity Committee has recommended the City Council to accept the following tenders :—

Bare copper cable, £5,217.—Standard Cable Manufacturing Co.
Battery for Phillip Street sub-station, £32,948.—Tudor Accumulator Co., Ltd.
Machinery for charging same, £10,581.—W. Guthridge, Ltd.
Switchgear, £7,415.—Australian G.E. Co.
Submarine cables, £2,389; underground cables, £3,408.—Noyes Bros.
Underground cables, £11,178.—Siemens Bros. Dynamo Works, Ltd.

The British Insulated and Helsby Cables, Ltd., has contracted to supply the Victorian Railway Commissioners with insulated lead-covered and armoured feeder cables in connection with the electrification of the suburban railways, the tender price being £259,121. The total amount of the electrification contracts let by the Commissioners is now £2,270,298.—*Tenders.*

Aberdeen.—The Electricity Committee recommends the acceptance of tenders for coal supplies from the following :—Aberdeen Coal Co., Messrs. George Elsmie & Sons, James Gordon, Charles Christie & Co., and the Carden Coal Co.

Bacup.—The T.C. has accepted the tender of Messrs. W. T. Glover & Co., Ltd., for supplying and laying cables in Newchurch Road.

Batley.—The Electricity Committee has arranged with the British Westinghouse Co., Ltd., for the supply and erection of a switchboard and gear required at the works.

Bedford.—The Borough Education Committee has appointed Mr. R. H. Crawley to carry out electrical work for the six months ended December 31st next.

Belgium.—As the result of the recent call for tenders, the Société d'Electricité de Seraing has secured the concession for the electric lighting of the little town of Rocour (Province of Liége).

Seven concerns—six German and one Belgian—submitted tenders last week to the Belgian Post and Telegraph authorities for the supply and laying of a quantity of telephone cables and cable heads in the Brussels district. The lowest offer was that of the Société A.E.G.-Union Electrique, of Brussels, which quoted £20,875.

Bradford.—The Electricity Committee has accepted the following offers :—

Mr. R. Gillam to purchase three steam dynamos now at the Valley Road Electricity Works, for £562.
Messrs. J. Blakeborough & Sons to supply five valves required at the Valley Road Electricity Works, for £147.
Messrs. Whipp & Bourne to supply two switchboards (distribution panels) required in connection with the new induced-draught fan motors at the Valley Road Works, for £109.
Clay Cross Co., Ltd., for the supply of about 24 tons of main circulating water piping required at the Valley Road Works, for £237.
Messrs. S. Parsons & Co. to supply six piled steel piers, &c., for Valley Road Works, for £130.

Dartford.—The U.D.C. has accepted the tender of Messrs. C. Isler & Co., Ltd., for fixing a 20-in. diameter artesian bored tube well for the E.L. works, at £411.

Darwen.—The Peel-Conner Telephone Works has secured a contract for telephone exchange equipment.

Derby.—The following tenders have been accepted :—

Motor alternator, £1,594.—General Electric Co., Ltd.
Telephone exchange equipment.—Western Electric Co., Ltd.

Folkestone.—The T.C. has accepted the tender of the Electric Street Lighting Apparatus Co., for six standards for electric lamps for the East Cliff, at £3 16s. each.

Hull.—At the meeting of the City Council on June 4th, Mr. Exley moved that tenders should be asked for from selected firms to supply the electrical fittings in the new Guildhall. This was seconded by Mr. Evans. It had been recommended by the Property Committee that the contract entered into with Mr. Wm. Smith, 1, Balcombe Street, London, on the advice of Mr. Cooper, the architect, be confirmed, and Sir Alfred Gelder, M.P., said that Mr. Cooper was a very capable and artistic man, on whose advice the Council might rely. Alderman Crook said that it was a rule that work over £50 should be tendered for, and the amount involved in this case was £1,084. Mr. Exley's amendment was defeated, and then Mr. Easton moved a further amendment that tenders be advertised for acceptance of the specifications of the architect. This was carried.

The City Council has accepted the following tenders :—

Brush Electrical Engineering Co., Ltd.—Twenty car bodies, at £481 each.
M. & G. Truck Engineering Co., Ltd.—Twenty trucks, at £49 17s. 6d. each.
Siemens Bros. Dynamo Works, Ltd.—Twenty pairs of motors for ordinary series parallel, at £181 per pair.
Twenty pairs of controllers (latest type), at £43 per pair.

Liverpool.—The Liverpool Overhead Railway Co. has placed an order with Messrs. E. Bennis & Co., Ltd., for two Bennis stokers and self-cleaning compressed-air furnaces for an 8 ft. diameter Lancashire boiler.

London.—An order from the G.P.O. (South), Knightrider Street (per the Howden Boiler Co.), for three Bennis chain grates, each 11 ft. 6 in. long by 3 ft. wide, has been received by Messrs. E. Bennis & Co., Ltd.

Messrs. Napier, Kimber, Ltd., Bayswater, have received the contract for electric bellhanging for H.M. Office of Works.

Messrs. Dick, Kerr & Co., Ltd., have received the contract for electric motor wagons, for the G.P.O. experimental railway, Woolwich.

Luton.—The B. of G. has accepted the tender of Messrs. Edmundson's for fixing telephonic instruments on the workhouse premises.

Malvern.—The U.D.C. has accepted the following tenders in connection with extensions at the electricity works :—

Engine.—Messrs. Belliss & Morcom.
Alternator, exciter, &c.—British Westinghouse Co., Ltd.

Manchester.—The tender of the Premier Accumulator Co. has been accepted for a storage battery at the head post office.

New Zealand.—The Christchurch City Council has accepted the tender of the British Electric Transformer Co. for transformers, at £3,635, and of Messrs. Turnbull & Jones for insulators, £250, and rubber mats, £86.—*Tenders.*

Northampton.—The tender of the Brush Electrical Engineering Co., Ltd., is recommended for acceptance, at £177, for the erection of a girder platform to carry the new turbo-generator.

Plymouth.—The Corporation Electricity Committee has accepted the tender of Cory Bros. for 9,000 tons of coal, at 16s. 7½d. per ton. The previous contract was 18s. 10½d., with a recent extension at 16s. 9d.

Rochdale.—The tender of Messrs. John Nicholl & Son for a liftway for an electric book lift in the borough treasurer's department has been accepted. Eleven tenders for the supply of an electric book lift have been referred to a sub-Committee.

Salford.—The tenders of Messrs. L. E. Wilson & Co. have been accepted by the Finance Committee, at £70 10s., for the supply and erection of intercommunication telephones in the Police Department in the Town Hall, and at £24 for maintenance, repairs and renewals for a period of ten years. The Electricity Committee has accepted the tender of William Gornall, at £2,513, for the erection of a transformer sub-station and machine foundations in Robert Hall Street.

Sevenoaks.—The contract for the lighting of the Parish Church "St. Nicholas" has been secured by Messrs. S. Young and Son, of Sevenoaks.

Sheffield.—The following tenders are recommended to the City Council for acceptance:—

Ruston, Proctor & Co., Ltd. (with the General Electric Co., Ltd., as sub-contractors).—Electric generating plant, driven by suction gas producers and gas engines.
Brown, Bayley's Steel Works, Ltd.—500 steel tramcar tires, 24s. each.
Abbott & Bannister, Ltd.—Erection of transformer sub-station, £651.

Tunbridge Wells.—The T.C. has accepted the tender of the British Thomson-Houston Co., Ltd., for a 300-KW. steam alternator and condensing plant, at £3,181.

Warrington.—The Electricity and Tramways Committee recommends the acceptance of the following tenders:—

Johnson & Phillips, Ltd.—Transformers.
Electric Construction Co., Ltd.—D.C. motors.
British Thomson-Houston Co., Ltd.—A.C. motors.
Swan, Ratcliffe & Co., Ltd.—Boiler setting, £177.
Johnson & Phillips, Ltd.—Cables, £696.
Walter Scott, Ltd.—100 tons steel tramway rails, £7 10s. per ton.

York.—The Tramway Committee has accepted the tender of the Brush Electrical Engineering Co., Ltd., for supplying eight of the tramway cars with coupling bars at each end, and for the provision of attachments for coupling the light and bell signals for communicating between the motor-car and trailer, and making the necessary alterations to the cars, at £27 10s. per car.

The Electricity Committee has accepted the tender of the General Cable Manufacturing Co., London, for high and low-tension cables required by the Electricity Department, at the sum of £6,358 plus £50 for two ducts instead of one. The tender was the lowest received.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—Lieut.-Col. H. M. Leap.

The following orders have been issued:—

Friday, June 12th.—"D" Company. Infantry drill, 7 to 8.30 p.m. Technical instruction, 8.15 to 10 p.m. Miniature range instruction, 8.15 to 10 p.m.

Saturday, June 13th.—All Companies. Annual course of musketry at Purfleet rifle ranges. Headquarters will be opened for regimental business from 10 a.m. till 12 noon.

Monday, June 15th.—"A" Company. Infantry drill, 7 to 8 p.m. Technical instruction, 8.15 to 10 p.m.

Tuesday, June 16th.—"B" Company. Infantry drill, 7 to 8 p.m. Technical instruction, 8.15 to 10 p.m.

Wednesday, June 17th.—All Companies. Rating examinations, 7 to 9.30 p.m.

Thursday, June 18th.—"C" Company. Infantry drill, 7 to 8.30 p.m. Technical instruction, 8.45 to 10 p.m.

Friday, June 19th.—"D" Company. Infantry drill, 7.30 to 8.30 p.m. Technical instruction, 8.45 to 10 p.m.

Saturday, June 20th.—All Companies. Annual course of musketry at Purfleet rifle ranges. Headquarters will be opened for regimental business from 10 a.m. till 12 noon.

(Signed) F. R. Holt-White, Capt. R.E., Adjutant,
For Officer commanding L.E.E.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, June 12th. At 8 p.m. At Imperial College of Science, South Kensington, S.W. Papers on "A Magnetograph for Measuring Variations in the Horizontal Intensity of the Earth's Magnetic Field," by Mr. F. E. Smith; "The Atomic Weight of Copper by Electrolysis," by Mr. A. G. Shrimpton; "An Improvement in the Einthoven String Galvanometer," by Mr. W. H. Apthorpe.

North of England Institute of Mining and Mechanical Engineers.—Saturday, June 13th. At 2 p.m. At Wood Memorial Hall, Newcastle-on-Tyne. General meeting.

Municipal Electrical Association.—June 15th to 20th. At Birmingham. Annual Convention.

National Physical Laboratory.—Friday, June 19th. At 3.30 p.m. Annual inspection.

Physical Society of London (Fellows only).—Saturday, June 20th. (Morning.) Visit Cambridge Scientific Instrument Co.'s Works. (Afternoon.) Visit to Cavendish Laboratory.

Salford Technical and Engineering Association.—Saturday, June 20th. Visit, Broadheath.

NOTES.

The Institution and the Industry.—The following letter reached us too late for our "Correspondence" columns:—

"Whilst deploring the dissolution of the Industrial Committee, and entirely agreeing with you that our Institution has a wider destiny than that of 'a Technical Debating Society,' I feel that it is unjust to lay the entire blame on the shoulders of the Council so long as the members at large take so little apparent interest in the matter. Apart from the Council and the representatives of the Press, I doubt if there were in all 10 members present at the recent annual meeting, and seeing that this question figured so prominently in the report, the Council might well assume from this that the majority of the members were in agreement with them.

"That such an assumption would actually be correct I very much doubt, but, at the same time, the *laissez-faire* attitude against which you inveigh is not to be found at the Council table alone. There has been a great deal of grumbling, but almost the only serious attempt to find a solution for an admitted difficulty is contained in the article by Mr. Wordingham, published in your issue of May 22nd.

"Mr. Mordey, I think, fairly expressed the views of the opponents of commercialism when he said at the annual meeting that he 'thought that the influence, dignity and usefulness of the Institution would be best maintained and increased by following the example that they had always had before them of giving their attention to the scientific and engineering foundations of the electrical engineering industry rather than by attempting in any way to make it a trade association.' While I do not think that anyone would suggest adopting the latter course, the 'example' which Mr. Mordey has before him is presumably that of the Institution of Civil Engineers. But that Institution occupies an absolutely unique position. It is to me almost as difficult to imagine a second Institution of Civil Engineers as a second Royal Society; in fact, in their different spheres the two would seem to be the embodiment of much the same idea, and I should be the first to deplore any tendency to commercialism in either.

"When we turn, however, to the relationship of our own Institution to the industry (I notice that Mr. Mordey speaks of the 'profession'), the case for allotting a place to commerce as well as to engineering strikes me as an extremely strong one.

"Even taking the opposite view, however, it will, in my opinion, be found increasingly difficult to maintain the interest in technical debates which has been possible in the past. In the early days a good paper on any electrical engineering subject was of interest to probably 80 per cent. of the members; now, thanks to specialisation, a similar paper is of vital interest to, perhaps, 10 per cent., and of some interest to another 10 per cent., while the remaining 80 per cent. do not give it a thought.

"On the other hand, there is one subject which (such is human nature) is of interest not to 80 per cent., but to 99·99 per cent. of the membership; and that is how to make money out of electricity, or, more euphemistically, how to 'strengthen and encourage the electrical industry.'

"Mr. Wordingham, I think, is really in agreement with this point of view, but seems somewhat loath to strike out a new line to meet the altered conditions. His suggestion is that each 'properly constituted Association' (such as the B.E.A.M.A.) should be represented on the Council of the Institution. This might, or might not, be a satisfactory method of constituting the Council (there are grave objections to it), but so long as the Institution, as a whole, is to be debarred from taking any part in commercial matters, does it actually carry us much further?

"Another course which suggests itself is that the Institution might have a commercial section as well as an engineering section, possibly each with its own committee responsible to one Council. However, the schemes, good, bad and indifferent, which can be suggested are innumerable, and cannot be discussed at all adequately in a letter.

"If it were once clearly demonstrated that the members, or, at any rate, a majority of them, were dissatisfied with the present state of affairs, I feel quite sure that the Council would willingly appoint a committee to investigate and report upon the whole subject. The future of the Institution rests, it seems to me, with the members themselves quite as much as with the Council.

"Kenelm Edgcumbe.

"London, *June 9th*, 1914."

The Kinematograph Exhibition.—We learn that circular letters have been issued in connection with this exhibition, from which an impression might be gained that we were exhibiting thereat. As this has led electrical manufacturers to ask us whether a stand there would be a good business proposition, we wish to state that we are not exhibiting, nor have we authorised the name of the Electrical Review to be used in connection with the undertaking. While we, of course, wish the exhibition every possible success, we desire it to be understood that our interest in the matter is limited to a promise to, as on the occasion of the last kinematograph exhibition, deal editorially and on their merits, with whatever electrical features may form part of the display.

Strike.—The men in the electrical department of the Glengarnock Iron and Steel Works, Kilbirnie, came out on strike demanding an increase of ½d. per hour. The strikers are supported by the Electrical Workers' Union.

Engineering Societies in Manchester.—A brochure recently issued gives particulars of the steps that have been taken towards the foundation of a joint establishment in Manchester as a communal home for the members of the various engineering and technological societies in the district. The first representative conference was held on May 1st in the rooms of the Manchester Geological and Mining Society, when 12 such bodies were represented, and Sir Thomas H. Holland was elected chairman. In the course of a speech on the origin and objects of the conference, the chairman remarked that in London it had been possible to establish metropolitan institutions in which the special requirements of mechanical, electrical, mining, sanitary and marine engineering had completely overshadowed the interests that were common to all varieties of engineers. Although "civil engineering" once covered everything that was not military, it was gradually becoming narrowed in meaning with the shrinking of the residue, from which there was taken intermittently one special extract after another.

Every engineer would admit that it was mainly through the Institution of Civil Engineers that a definite, high and universally recognised professional standard, both in competence and etiquette, had been successfully established. But excessive zeal in orthodoxy, like unnecessary ballast in a ship, might result in the sacrifice of speed for safety, and had the "Civils" been less rigid in some respects, they might have retained as colonial dependents those specialists who had now formed distinct institutions in separate homes.

The burden of divided interests so brought about was more especially felt by provincial members, many of whom had now to be members of two or more of the London special institutions, as well as of the Civil Engineers, without being able easily to obtain the advantages of attending meetings or of consulting the libraries. Provincial members thus paid for little more than the hall-mark of membership.

If by local co-operation they gave the younger engineer what the London institutions now failed to provide for their provincial members, the whole profession would benefit, and with it the central institutions would grow in wealth and power. They did not want amalgamation, but co-operation, and primarily for mere economy in the necessary "general charges" of rent and management. At the same time, community of lodgings would naturally grow into a recognition of community of interests, increasing mutual respect with personal knowledge, and thereby increasing business connections.

The most direct advantage, and one which could be obtained in no other way, was the formation of an efficient reference library. No public library and no university library could possibly take the place of that formed by the process of exchange between societies. The advantages in this respect to be gained by co-operation completely outweighed all other considerations, and were to him the chief public value of the present enterprise.

Some of the more imaginative supporters of the movement contemplated a grand engineering building, but any scheme of the kind, even if financially possible and free from risk, would take years to accomplish.

Resolutions were passed, appointing a provisional organising committee to draw up proposals for the consideration of the societies represented at the meeting, and naming as convener Mr. W. T. Anderson, 27, Queen's Avenue, Old Trafford, Manchester.

Recent Electricity Costs.—Some of the earliest of the annual accounts of municipal electrical undertakings which have reached us this year contain ample evidence of the downward trend of "costs of production" under modern conditions, with plant which cannot be regarded as large nowadays. Thus, the Coventry returns for 1913-14 show, on an output of 16¼ million units sold, with a 20·4 per cent. load factor, works and distribution charges amounting to ·289d. per unit, and total works costs of ·346d. per unit sold (or just over ·3d. per unit generated). Interest and sinking fund charges add ·307d. per unit to this figure (*i.e.*, total ·653d. per unit). Both turbines and engines are in use, and the coal per unit sold was a trifle over 3 lb. Coal cost 11s. a ton, and a certain amount of power was derived from a refuse destructor, which is not usually a help to low costs. The maximum load was 9,240 KW.

Turning to the Stepney electricity accounts, generating costs are to some extent obscured by the supplementary units purchased under agreement from Poplar. In this case 17,469,572 units were generated, presumably the greater proportion at the Council's new riverside turbine station; in addition, 2,665,000 units were purchased. The report gives the cost per unit generated, inclusive of bulk supply, as:—Works and administrative costs, ·461d. per unit; interest, sinking fund, &c., ·361d.; total, ·822d. per unit. The total cost per unit sold was just over 1d. The maximum generated load was, roughly, 7,000 KW., and in this case also a destructor plant rendered minor assistance.

The Leeds electricity accounts show an output sold of over 31 million units, and working expenses amounting to ·42d. per unit, which, added to interest and sinking fund charges, give a total of ·95d. per unit sold. These figures were no doubt adversely affected by the municipal strike which took place during the year. The maximum load on the plant was 13,880 KW., and both engine and turbine plant are installed.

The Accrington accounts, also to hand, are interesting, because the bulk of the output sold, which totalled 5,856,000 units, is generated by gas engine units working in conjunction with a by-product recovery plant; steam plant is also used, and destructors are credited with ·023d. per unit for heat supplied. The maximum supply demanded was 2,876 KW. The returns show generating costs amounting to ·542d. per unit, distribution costs, management, &c., bringing this up to ·737d. per unit; capital charges amounted to ·370d. per unit, a total of 1·107d. per unit sold, but allowing for sale of by-products, this figure is reduced to 1·03d. per unit. Coal cost, roughly, 13s. per ton.

Petroleum, Gas and Electrical Accidents in Germany.—According to an official report which has lately been issued, 169 accidents occurred last year in Germany in connection with petroleum, the majority being the result of the explosion and overturning of lamps. The accidents caused the deaths of 57 persons, slight injuries to 9, and serious injuries to 51 others. Gas was responsible for no less than 413 accidents, resulting in the death of 134 persons, serious injury to 335 people, and slight injuries to 76. As regards electricity: there were 251 accidents during the year, in which 147 persons, including 74 employed at central stations, were killed, 71 badly injured, and 10 slightly so. As regards the cause of the electrical accidents, the majority, 126, were due to coming into contact with wires, 38 were caused by short-circuits, 14 occurred during repairs to conductors, 14 by climbing electrical masts, 6 were due to the falling of overhead conductors, 23 were ascribed to imprudence, while in 3 cases the cause was unknown. No less than 122 of the electrical accidents occurred in the open air, 3 in houses, 51 in works, 37 in central stations, 5 in public buildings, 4 in hotels and restaurants, 8 in theatres and exhibitions, 1 at a railway station, and 20 in mines. In addition to the foregoing 15 persons committed suicide with petroleum, 464 with gas, and 5 with electricity.

Water Power in Norway.—Prof. Olaf Heggstad recently lectured at the Technical College, Trondhjem, on the history of Norwegian water-power, and its future. He stated that the rights of the Rjukanfos, which by next year will be able to produce more than 250,000 H.P., were sold in 1890 for £55 10s., a transaction which the vendors considered to be very good business. Up to the present there have not been any reliable figures as to the actual amount of power available in Norway, and a Commission has been appointed to inquire into the question. In the meantime it has been ascertained that there are, at all events, six million horse-power which can easily be harnessed; but there are also a number of rivers in the western and northern parts of the country which have not been taken into account, and it should not be far out to put the actual figures at anything between eight and ten million horse-power, after the regulation of the rivers has been completed. At the present time there are 700,000 H.P. harnessed, of which 500,000 H.P. are conceded to foreigners. It is easy to see of what immense value the development of such enormous resources of power will be to the country. In a few years' time the amount will have reached one million horse-power, which alone represents a revenue of two million pounds a year. But this is only the direct value, and if the indirect value of the energy as employed for industrial purposes be taken into consideration, the social-economical value will, at the lowest, be five times as much or ten million pounds a year.

The Del Monte Process of Coal Distillation.—We recently had the opportunity of inspecting the Del Monte plant for the distillation of oils from coal, shale, peat, sludge, &c., which is now being operated on a commercial scale by Messrs. Oil and Carbon Products, Ltd.

The Del Monte retort is extraordinarily compact as compared with the standard Scottish shale oil plant; it consists essentially of an inclined steel tube 18 ft. long and 14 in. diameter, into the lower end of which fuel is fed through a hopper and conveyed up the tube by a revolving cast-iron worm, being finally discharged as coke at the upper end. The feed and discharge valves are arranged for simultaneous operation. The retort is enclosed in a brickwork chamber and heated at the sides by gas flames to a moderate temperature—which can be adjusted at various points—reaching about 450° C. at the point where full distillation takes place. The feature of the process is the collection of the distilled oil vapour, and this is effected by forcing a current of gas in at the discharging end of the worm—incidentally cooling the coke—the gas as it passes along the retort carrying with it the oil vapours at the moment of formation into the cool neighbourhood of the entering material, where they are condensed, the oil being subsequently removed at intervals. The lighter fractions, which will not liquify in this way, are carried off in the gas to a scrubber, and recovered in the usual way, the gas subsequently being used for retort heating, &c.

A single unit retort deals with 10 tons of bituminous coal, or 5 tons of hard cannel or shale a day, the yield of oil (which on treatment yields a high percentage of motor spirit, and all the usual petroleum products), varying from 25 to 130 gallons a ton. In view of the attention which is being directed to the gasification of fuel, and recovery of by-products in connection with bulk electricity generating schemes, the above process may interest electrical engineers. The coke secured from the Del Monte process is quite suitable for gas production, and the subsequent ammonia recovery treatment.

It is stated that a ton of cannel coal, costing 7s., used in this process, has given some 68,000 cb. ft. of gas (some of which is used for retort heating), 58½ gallons of crude oil, and 54½ lb. of sulphate of ammonia.

Conference in Germany.—The Verband der Elektrotechnischen Installationsfirmen in Deutschland (Union of Electrotechnical Installation Firms in Germany) commenced its 12th annual meeting in Dortmund, yesterday.

Electricity and a Floating Oil Factory. — An interesting article in an American contemporary (*International Marine Engineering*) described the ss. *Mills*, of Philadelphia, which serves the purpose of a floating fertiliser and oil factory. In connection with the catching of the fish and the conversion of them into valuable products electricity is extensively used. The purpose of the vessel is to catch menhaden fish, which are met with in large schools, and in connection with the main factory ship a number of small scouting vessels are used, which, on finding a school, signal to the main vessel by means of wireless telegraphy. The fish look like herring, but are not edible, the chief product being the menhaden oil, which is used in the tanning of leather and in the mixing of paints. In addition to this, the fish scrap from which the oil has been extracted, is sold as a fertiliser.

All the machinery involved in the manufacture of the fertiliser is driven by electricity, and a powerful arc lighting and searchlight plant is on board, so that the work of catching and treating the fish goes on interruptedly day and night. The external appearance of the vessel is somewhat peculiar. There are apparently a considerable number of masts projecting from the storage bins, these being really funnels through which electric blowers force the impure air from the inside storage tanks. The vessel carries a complement of 160 men divided into two shifts, one for day and the other for night work, and has to keep enough supplies on board to feed this crew for two weeks or a month at a time, and also a storage of 10,000 barrels of food fish. Every day the vessel converts the menhaden which are caught into 800 barrels of oil and 20 tons of fertiliser. When a school of the fish is found, nets are slung over the side of the vessel and hauled in by electric hoists until the bins are full. Screw conveyors, driven by motors, carry the fish into smaller receiving tanks, and automatically feed them into the steam cookers, and in a few minutes the fish are reduced to small particles. Then the cooked fish is forced through a rotary press to extract the oil, which is conveyed to testing tanks. After it is here found to be sweet and pure, it is cooled, and is conducted into storage tanks of 20,000 barrels' capacity. The fish scrap, or fertiliser, from which all the oil has been extracted, is blown by an electric fan and dried as it is forced by the draught into other storage bins, where it is bagged as it arrives. This fish scrap is very inflammable, and the room in which it is stored is protected by an electric thermostat, and, in case of fire, the store is flooded at once.

In addition to the menhaden, a quantity of fish good for food, such as haddock, &c., is caught. These are sorted out and placed in cold storage, an electrically-driven ammonia cooling plant being used. When the storage tanks and bins are full the wireless plant is called into use to summon barges and tugs to remove the cargo to the nearest shipping point. In this way a large amount of time is saved, and the boat is always operated at its full capacity. This vessel is an interesting example of the various ways in which electricity is utilised in the service of mankind.

Foreign Trade in May.—The returns for the month of May contain the following figures of electrical and machinery imports and exports:—

Imports.	*May.*	*Inc. or dec. compared with* 1913.
Electrical goods ...	£126,857	Inc. £8,134
Machinery	£737,423	Inc. £87,061
Exports.		
Electrical goods ...	£386,828	Dec. £78,244
Machinery	£3,386,886	Inc. £130,910

For the five months of the year the electrical imports show an increase of £26,710, and the electrical exports an increase of £85,351.

Electric Vehicles at the I.M.E.A. Convention.—We are informed that 11 electric vehicles will be on view in front of the G.E.C. Works, at Witton, during Tuesday afternoon next. Particulars of these can be obtained at the Midland Institute, Birmingham, on Tuesday morning. The General Vehicle Co. (New York) will have on view a ½-ton parcel van, and a 2-ton heavy van, the former equipped with a flat-plate lead battery, and worm-gear drive, and the latter with an ironclad Exide battery and chain drive. The controllers, running switches, charging plug receptacles, lamp switches and fuses are enclosed in metal boxes, and the wiring is in conduit.

Institution and Lecture Notes.—PHYSICAL SOCIETY OF LONDON.—At the meeting held on May 22nd, "Experiments with an Incandescent Lamp" were described and exhibited by Mr. C. W. S. Crawley and Dr. S. W. J. Smith. The first of these experiments was due to Mr. Addenbrooke, who, using a 100-volt lamp filled with paraffin oil (after removing the tip) as a convenient high resistance in a 200-volt circuit, noticed that some of the many bubbles forming on the filament behaved in a curious way. Instead of rising at once to the surface from the point at which they formed, they ran down the legs of the filament, against gravity, and then escaped at the leading-in wires. Dr. Smith, led to repeat this experiment by Mr. Crawley, discovered another, more striking, phenomenon. Placing the 100-volt lamp in a 100-volt circuit in series with a variable resistance, it was found possible, by momentarily cutting out most of the resistance, to obtain a single bubble upon the wire. Instead of escaping at either terminal, as in Mr. Addenbrooke's experiment, it travels backwards and forwards between the two, "looping the loops" of the filament in a fascinating way during every journey. It was shown, from the experiments, that a rapid fall of temperature from the wire through the liquid, in the region through which the bubble moves, is an essential condition of the phenomenon, and also, from theoretical considerations, how this condition can be used to explain why the bubble moves in the manner described.

On Saturday, June 20th, the Society will visit the Cavendish Laboratory and the works of the Cambridge Scientific Instrument Co.

IRON AND STEEL INSTITUTE.—The autumn meeting of the Institute will be held in Paris on Thursday, Friday and Saturday, September 17th, 18th and 19th. On the conclusion of the meeting in Paris a visit will be made to Nancy. September 21st and 22nd will be devoted to visits to the principal iron mines and metallurgical works of French Lorrane.

ROENTGEN SOCIETY.—At the annual general meeting on Tuesday an interesting exhibition of apparatus was organised, showing recent progress; radiographs can now be taken through the thickest parts of the body with an exposure of 0·01 second. The electroscope, which has become so useful an instrument in connection with X-rays and radium, has left the laboratory stage, and new types suitable for general purposes were exhibited. Mr. F. H. Glew read a paper on charging lithium salts with radium emanation, the effect of this operation being that the lithium salts then gave out a radiation similar to X-rays; the colour of the salt was changed from pink to blue, but as the activity of the radiation diminished the normal colour gradually returned.

ASSOCIATION OF TEACHERS IN TECHNICAL INSTITUTIONS.—At the Conference which was held at Liverpool last week, the burning question of examinations was discussed, and the system of external examinations was roundly condemned. Fortunately a strong movement is in progress to free technical education from this incubus, and credit was given to the Board of Education for taking the initiative in this direction.

Half-Watt Lamps of Low Candle-Powers.—This subject is attracting attention in electrical circles in Germany, where contradictory opinions appear to prevail in regard to the present possibility of manufacturing such lamps of low candle-powers. At the annual meeting of the Bergmann Electricity Works Co., on May 19th, it was mentioned that the glow lamp department was developing favourably, and the company was obtaining the same satisfactory results with the half-watt lamp as the other companies. It was added that there were no half-watt lamps of less than 200 C.P., and that the experiments made to produce them had not yet been brought to a conclusion. It was, however, possible that the construction of lamps for lower powers would be achieved in the near future, but in the meantime announcements otherwise made were declared to be based upon a misunderstanding. This statement by the Bergmann Co. forms a striking contrast to that which was made earlier in May by Herr Emil Rathenau, of the A.E.G., and which was reproduced in this journal on May 22nd. As will be seen on reference to that issue, the director is reported to have asserted that the company had already succeeded in manufacturing half-watt lamps for powers reaching down to as low as 25 C.P. It is improbable that a statement of this kind would have been made without some foundation in fact, and the only conclusion to be drawn from the contradictory views in question is that the experiments conducted by the A.E.G. have been carried to a more advanced stage than those undertaken by the Bergmann Co. The position of affairs is all the more interesting when it is borne in mind that both companies, as well as the Siemens & Halske Co., or the Siemens-Schuckert Works and the German Incandescent Gas Light (Auer) Co., utilise the same United States patents, the Bergmann Co. working under a licence.

Fatalities.—Our Cape correspondent writes:—"In connection with the recent death of a native at the Wharf, East London, apparently from electric shock, serious developments have taken place. As the result of an inquiry, it has transpired that the natives were accustomed to wash their feet in a pool near where some iron rails were lying. Two youths had on previous occasions connected these rails to the lighting supply, and several natives had received shocks. On this occasion, however, the ground near the rails being wet after recent rains, the native received so severe a shock that he died."

According to the *Daily News*, on the 4th inst. a man named Kirkham, engaged at the new London Colliery, Kimberley, Notts., "became entangled in the cogs of the electric driver, and was cut to pieces before the motor could be stopped."

Appointments Vacant. — Applications are being invited for the Chair of Physics at Birmingham University (£750 per annum), rendered vacant by the death of Dr. J. H. Poynting, F.R.S.; a professor of chemistry (£600 per annum) is wanted for the Heriot-Watt College, Edinburgh.

Chief lecturer and head of Electrical Engineering Department of Royal Technical Institute, Salford (£225); assistant engineer (£150), for Kilmarnock Corporation; shift engineer, age 25 (£175), for Manchester Corporation. Particulars are given in our advertisement pages to-day.

Inquiry.—Makers of cane glass hub-making machines for electric lamp making are asked for.

Operating under Difficulties in Mexico.—The civil war now going on in Mexico has made it necessary for all large industrial companies to adopt means to safeguard their property. Armed guards are therefore established to resist, not the attacks of the contending forces, but the incursions of marauding bandits, who take advantage of the chaotic conditions at present existing in Mexico and commit depredations on private property. The electric lighting companies, among others, have found it necessary to adopt defensive means, and an insight into the conditions existing is afforded in the case of the Mexican Light and Power Co., which operates the largest hydro-electric station in Mexico at Necaxa, about 125 miles from the city of Mexico. The plant has an effective head of about 1,400 ft., and develops over 50,000 KW., which is transmitted to the city of Mexico at 88,000 volts.

Trouble was at first encountered at night, because of miscreants within the station who sympathised with the rebels tripping out the exciter circuit-breakers and tampering with important switches. Cement dust was sprinkled on the concrete floor for the purpose of discovering whether the culprits wore shoes, the sandals of the peon, or were bare-footed. Doors were also locked in order to protect certain apparatus. By this means a Mexican oil and rebel sympathiser was apprehended. A powerful 30-in. projector, fed with direct current from a motor-generator set, is used at night to sweep the surrounding country in search of rebels and bandits. One night the generator of the motor-generator set used for the searchlamp was discovered wrecked, and dirt was found in the bearings. This was done by some sympathiser in order to hide the movement of a number of Zapatistas six miles off. By prompt work and not very elaborate repairing, the projector was placed in service again that night, and an electrician was placed in charge of it. Part of the operating force was also sent out on guard duty in anticipation of an attack, which fortunately did not take place. Everyone in the power house is armed with a Mauser rifle furnished by the company.

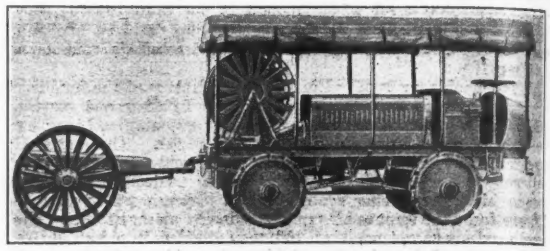
Not long after the above incident a man was shot, and it was determined to run a line down to the likeliest place of trouble and light up the trail by means of four 60-watt tungsten lamps, controlled by a switch at the sentry box overlooking the trail. An enamelled wash-pan was placed behind the lamps to serve as a reflector and keep in darkness the background where the armed operators were stationed. Another of these home-made bull's-eye lanterns was placed on a different trail, and when seven or eight weeks later there was a little fuss in the locality these lanterns became very useful. Two prisoners were taken alive, and a third was shot. Station operators were able to track him by blood marks to where he left the trail in the dark and evidently plunged headlong to his death in the canyon below, for two days later buzzards flocked to the spot.

Of course, it is necessary to protect the power station, although it is situated in a rather inaccessible canyon, since the city of Mexico depends upon it for transmitted energy for public and private lighting and for railway purposes. From five to 85 soldiers are quartered at the station at various times. Some of these are good men, some scoundrels, and others absolutely worthless. There are also a Hotchkiss rapid-fire field gun and three Colt machine guns available at the station in case of attack. Strange as it may seem, the transmission lines are not tampered with very much. The rebels at first climbed the steels towers and cut the lines with machetes, but inasmuch as this resulted in a 88,000-volt arc and a dead rebel, and was not very helpful to the cause, these pranks were short-lived. The rebels then began shooting at insulators. One night all four lines were shot down almost simultaneously, as well as the telephone lines strung on the transmission towers. However, there was a telephone line on wooden poles some distance from the transmission line but parallel to it which was fortunately overlooked, and over this communication was had with Mexico City. This trouble occurred during a New Year's celebration and left the theatres, streets and dance halls in darkness, also tying up the railways until a small steam plant in Mexico City could be started. No rioting occurred in the city, and the President himself telephoned to the plant at Necaxa to ascertain whether or not it had been taken by rebels. Next morning soldiers were started from the plant and also from Mexico City, travelling toward each other. This was the only time on which all four lines went down at once, and the lines since then have been constantly patrolled, so that trouble from this source has been almost entirely eliminated.

Needless to state, because of the presence of rebels or bandits in the vicinity the station operators do not stray far from the station. Two men were out on an inspection trip recently on a hand-car on the little narrow-gauge railroad, 25 miles long, by which the station is reached, and on the way back were met at a turn in the road by six bandits. One had a rifle, but the others were armed only with machetes. The car was going down grade, and although ordered to stop the two men, both armed, continued on. One or two shots were fired, and a peon said later that one of the bandits had been killed. Bandits, when captured by the Government troops, are in most cases executed by a firing squad of five men in charge of an officer. The usual and official custom is to have all five soldiers shoot with ball cartridges, then the officer stabs the victim with a sabre or shoots him with a revolver to make certain of his death.

There are no wagon roads in the vicinity of the generating station, so that no wheel vehicles are to be found anywhere about the plant. The site is almost impregnable. All transportation except that by the private narrow-gauge road owned by the company is by human beings or animals. Indians carry enormous loads on their backs, supported by a band passing over the forehead, and Mexicans are expert in loading pack mules.—*Electrical World.*

An American Searchlight Wagon.—The Couple Gear Freight Wheel Co., of Grand Rapids, Mich., U.S.A., has recently completed a special petrol-electric motor-wagon to the order of the U.S. Naval authorities for use in connection with the haulage and operation of powerful electric searchlights. The engine, instead of being located at the front of the chassis, as usual, is fixed under a bonnet behind the driver's seat; it is of the four-cylinder type—the bore and stroke being 5¾ in. × 6 in.—and is coupled direct to a 13-KW. dynamo. For driving purposes, each



PETROL-ELECTRIC SEARCHLIGHT WAGON.

of the four road wheels is provided with an electric motor built up with the wheel itself. Each of the hubs is also provided with a capstan head, so that the vehicle can, by means of a cable, pull itself out of any difficult places in the road over which it may be travelling. At the rear of the wagon are two reels on which are wound lengths of flexible cable used to conduct the current from the wagon to the searchlights, or other electric appliances which may be in use at a distance. A two-wheeled trailer used for the transportation of the searchlight apparatus is towed at the rear of the wagon, which is capable of attaining a speed of 15 miles per hour.

The Electrified Defences of Matamoras, Mexico.—During one of the attacks made by the Mexican Constitutionalists upon the Federal forces in the city of Matamoras, Mexico (which is just opposite Brownsville, Tex.), the defending Federal troops entrenched themselves behind a barricade of barbed wire, and then, as an afterthought, their commander hit upon the pleasant scheme of connecting this barbed wire to the lines of the Matamoras electric plant, so that a deadly shock would be given persons making contact with it. During a fierce assault on the Federal works six or seven Constitutionalist soldiers were electrocuted by the wire before the deadly nature of the barricade became known. Withdrawing his infantry for the time being, the rebel general then directed his field guns upon the electric plant, with the result of quickly shutting it down. Returning to the assault, the now innocuous barbed-wire entanglement proved only a slight obstacle to the final capture of the city by the Constitutionalist forces.—*Electrical World.*

International Congress.—The sixth International Congress of Mining, Metallurgy, Engineering and Economic Geology will be held in London on July 12th to 17th, 1915. Ordinary members pay a fee of £1, which entitles them to attend the meetings and receive the proceedings of one of 14 sections. Particulars can be obtained from the Secretary, International Congress, 28, Victoria Street, S.W.

Educational Notes.—CITY AND GUILDS TECHNICAL COLLEGE, Leonard Street, Finsbury, E.C.—Entrance examination on September 22nd. Particulars are given in our advertisement pages.

MUNICIPAL SCHOOL OF TECHNOLOGY, Manchester.—Matriculation and entrance examinations will be held in July and September. The 1914-15 session will open on October 6th; particulars will be found in our advertisement pages.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Subject to the usual sanction, the salary of MR. T. HALL, engineer of the Burton-on-Trent electricity undertaking, is to be increased from £275 to £350 per annum, and by a further £50 in 1915. The Council is recommended to make the following increases in the salaries of the undermentioned charge engineers:—MR. MELBOURNE, from £160 to £200 per annum (this figure to be the maximum), by increases of £20 now and two further increases of £10 per annum; MR. MELLOR, from £2 8s. to a maximum of £2 10s. per week;

Mr. Knight, from £2 to a maximum of £2 10s. per week, in three advances; Mr. Wakefield, from £1 18s. to £2 10s. per week, in four advances.

Messrs. T. Hollins and G. Sowersby, assistant to mains superintendent, and junior shift engineer, respectively, at the Watford electricity works, have resigned their appointments.

The Wimbledon E.L. Committee recommends an increase of salary to Mr. W. J. Oswald, one of the engineers-in-charge at the works, from £156 to £182 per annum.

Bexhill-on-Sea T.C. by eight votes to six has declined to allow Mr. A. C. Ticehurst, the electrical engineer, to act as consulting engineer to the Battle B. of G. who recently had the E.L. installed at the Workhouse, at a fee of £6 6s. per annum.

The Darwen Corporation has increased the salary of Mr. Percy Taylor, assistant electrical engineer, from £91 to £104 per annum.

Mr. Frank H. Whysall, resident engineer in the Manchester Corporation electricity department, has been appointed borough electrical engineer to the Greenock Corporation in succession to Mr. James A. Robertson, now at Salford. Mr. Whysall was formerly in the service of the Sheffield municipality, and has been resident engineer at Manchester for 12 years. The eight candidates on the short leet were interviewed by the Council on Friday, with the above result. Mr. J. Allan, of West Ham, was in the short leet.

The marriage took place at Winchmore Hill Congregational Church, London, N., on Saturday, of Mr. Sydney James Vince, district sales engineer at Enfield for the electricity supply company, and formerly of the electricity staffs at Ipswich and Marylebone, and Miss Dorothy Gertrude Potter, second daughter of Mr. Charles W. Potter, of Ipswich.

The Barnstaple E.L. Committee recommends the T.C. to increase the salary of Mr. J. W. Hadfield, engineer, of the Municipal Electric Light Works.

The Crewe T.C. has increased the salary of the engineer at the electricity works (Mr. T. Keenlyside), from £150 to £165 per annum.

Tramway Officials.—The Hull T.C., on June 4th, adopted a recommendation by the Tramways Committee to increase the salary of the traffic manager, Mr. M'Combe, from £500 to £600, £50 this year, and £25 in each of the following two years.

Mr. J. W. Thorpe, works foreman of the Halifax tramways, has been appointed works superintendent of the Oldham Corporation tramways, at a salary of £156 per annum.

General.—We understand that Mr. A. Macfarlane, who was for the last five years responsible for the fittings department of Siemens Bros. Dynamo Works, Ltd., Dalston, has resigned his position.

Mr. George Ledger, of Blackheath, who is approaching the age of 79, has just completed his fiftieth year of service with the Telegraph Construction and Maintenance Co., Ltd., at Enderby's Wharf, East Greenwich.

Mr. John Ewart Treanon, B.Sc., electrical engineer for the La Junta Consolidated Gold Mining Co., Telluride, Colorado, U.S.A., was married on June 3rd, at the Wesley Church, Lancaster, to Miss Ada Till. A characteristic telegram was received from the mine:—"Best wishes for the man from Colorado who went to Collar Ada!"

Mr. W. B. Duckworth, a young electrician on the ill-fated *Empress of Ireland*, who is reported amongst the saved, hails from Morecambe. He is only 27 years of age, and was formerly on the *Lusitania*.

Mr. J. F. C. Snell was on Monday last elected a member of the Royal Institution.

The salary of Mr. Holme, the telephone manager at Hull, has been increased from £325 to £500 a year, as with the purchase of the National Telephone Co.'s plant in the Hull area, the business has increased fourfold.

The Cambridge Philosophical Society has elected Madame Curie, Prof. H. A. Lorentz, Prof. M. Planch and Prof. P. Zeeman honorary members of the Society.

According to a notice in the *Times*, Mr. Alfred William Beuttell was married on 5th inst. at Christ Church, Streatham, to Miss Ida Augusta Locke.

The Council of the Royal Society of Arts, with the approval of the President, H.R.H. the Duke of Connaught, have awarded the Albert Medal for the current year to Chevalier Guglielmo Marconi, D.Sc., LL.D., "for his services in the development and practical application of wireless telegraphy." The Medal was instituted in 1862 as a memorial of the Prince Consort, and is awarded annually for distinguished merit in promoting arts, manufactures or commerce.

Obituary.—Mr. W. Scott.—A Scottish correspondent writes with reference to the recent loss of the *Empress of Ireland*:—"Despite news earlier in the week announcing the safety of Mr. Walter Scott, electrical engineer, Montrose, an official statement from the Canadian Pacific Railway Co. to his relatives has brought the information that he was among the lost. Deceased, who had decided to make a surprise visit to his mother, was 26 years of age. He served his apprenticeship as an electrical engineer with Mr. J. L. Warden and the North of Scotland Electric Light and Power Co., Ltd., Montrose, and was subsequently in the Fairfield Shipbuilding Yard, Glasgow."

Mr. Percy Fairman.—Mr. P. Fairman, electrical engineer, engaged at Quex Park, Birchington, was drowned whilst bathing in the sea at Hythe on Whit Sunday.

Herr Johann Weiss.—The death is announced from Bad Nauheim, at the age of 66 years, of Herr Johann Weiss. The deceased was the founder in 1880 of the Electritechnischewerke Johann Weiss, of Landshut, Bavaria, which were among the first in Germany to take up the manufacture of dynamos and arc lamps in that country.

The Late A. Bruce Anderson.—At an extraordinary meeting of the Council of the British Electrical and Allied Manufacturers' Association, held at 36, Kingsway, on Monday last, the following resolution was passed, after which the meeting adjourned till the 25th inst.:—"Resolved that the Council of this Association, in meeting assembled this 8th day of June, 1914, deplore the untimely death of their late Chairman, A. Bruce Anderson, who perished at the sinking of the *Empress of Ireland* in the St. Lawrence River, on the 29th of May, and desire to place on record not only the loss of the chief executive officer of the Association, through whose efforts mainly it has reached its present position, but also the loss of a personal friend; and that a copy of this resolution be sent to Mrs. Anderson, with an expression of their deepest sympathy for her in her sad bereavement."

NEW COMPANIES REGISTERED.

Brough Electric Lighting Co., Ltd. (136,099).—This company was registered on May 28th, with a capital of £1,500 in £1 shares, to carry on at Brough, Westmorland, the business of an electric lighting company. The subscribers (with one share each) are:—W. Coates, Brough, Westmorland, draper; F. F. Yare, Brough, Westmorland, tailor; I. Bainbridge, Brow, Westmorland, physician and surgeon; C. E. Kilvington, Brough, Westmorland, gentleman; T. Taylor, Brough, Westmorland, tailor; G. Small, Brough, Westmorland, saddler; T. Bell, Brough, Westmorland, grocer. Minimum cash subscription, £1,200. The first directors are W. Coates, F. F. Yare, I. Bainbridge, C. E. Kilvington, J. Reynoldson, G. W. Bailey and J. B. Walton; qualification, 10 shares. Registered office, Helbeck Mill, Brough, Westmorland.

G.M. Wireless Patents Syndicate, Ltd. (136,040).—This company was registered on May 26th, with a capital of £3,000 in £1 shares, to acquire and turn to account any invention relating to wireless telephony or telegraphy, or the transmitting, recording and reproduction of telephone and telegraph messages, &c. The subscribers (with one share each) are:—H. G. Matthews, Morton Hotel, Russell Square, W., inventor; Lieut.-Col. J. B. Butler, The Grove, Stoke Bishop, Bristol. Private company. The number of directors is not to be less than two or more than six; the subscribers are to appoint the first; qualification, 20 shares. Registered office, 2, Coleman Street, E.C.

A. B. Vibro and Domestic Electrics, Ltd. (136,149).—This company was registered on May 30th, with a capital of £6,000 in 5,940 7 per cent. cumulative participating preference shares of £1 each and 2,400 founders' shares of 6d. each, to carry on the business of manufacturers of, and dealers in, electrical and other vibrators and all kinds of switches, rheostats, resistances and instruments ancillary thereto, to undertake the establishment of institutes for the treatment of persons, to carry on the business of chemists and druggists, &c., and to adopt an agreement with W. R. Ansell. The subscribers (with one share each) are:—P. Manton-Myatt, 21, Dorville Road, Ravenscourt Park, W., musician; H. R. Holmes, 32, Southcroft Road, Tooting, S.W., shipping clerk; J. A. Ellis, 27, Broad Street, Ratcliffe, E., shipping clerk; T. Brain, 14, Bourne Place, Duke's Avenue, Chiswick, W.; L. M. Shepherd, Fir Cottage, Bounds Green, N., shipping clerk; W. R. Ansell, 3, Chapel Court, Borough High Street, S.E., merchant; A. Quaife, 18, Millard Road, Stoke Newington, N., secretary. Minimum cash subscription, seven shares. The number of directors is not to be less than three or more than five. W. R. Ansell is one of the first. Registered office, 58, High Street, New Oxford Street, W.

British Willard Battery Co., Ltd. (136,098).—This company was registered on May 28th, with a capital of £10,000 in £1 shares (3,000 "A" and 7,000 "B"), to carry on the business of sellers, manufacturers, assemblers, fitters, adjusters and repairers of electric accumulators and storage batteries, and articles connected with, or relating to, electric cables, connections, jars, electrolyte, fittings and accessories, and to adopt an agreement with the Willard Battery Co., of Cleveland, U.S.A. The subscribers (with one share each) are:—J. F. Rowlate, 38, Bedford Row, W.C., solicitor; T. A. Kirkham, 38, Bedford Row, W.C., solicitor. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first; qualification, one share; remuneration (except managing director), £600 per annum. Registered office, 37, Bedford Row, W.C.

Hammersmith Welding, Engineering and Electrical Co., Ltd. (136,136).—This company was registered on May 29th, with a capital of £250 in £1 shares, to take over the business of T. H. R. Heard and R. C. Heard, trading as the Hammersmith Welding Co., and to carry on the business of welders of metals, mechanical, electrical, and general engineers, founders, smiths, braziers, machinists, plumbers, electricians, workers in electricity, &c. The subscribers (with one share each) are:—A. H. Hunter, 78, Elsham Road, Kensington, W., engineer; T. H. R. Heard, 3, Station Road, Shepherd's Bush, W., engineer. Private company. The number of directors is to be two; the first are A. H. Hunter and T. H. R. Heard (both permanent); qualification, £50. Solicitor, L. Boyes, 2, Pancras Lane, E.C.

Molybdenum and Tungsten Traders, Ltd. (136,143).—This company was registered on May 29th, with a capital of £1,000 in £1 shares, to carry on the business of refiners, smelters, assayers, metallurgists, and contractors, dealers in molybdenum, tungsten and other mines, &c., and to adopt an agreement with C. Vautin. The subscribers (with one share each) are:—P. B. Smyth, The Clock House, Wanstead, accountant; A. E. Tester, 142, Shaftesbury Avenue, Norbury, S.W., clerk. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first; qualification (except first directors), £100; remuneration as fixed by the company. Registered office, 638, Salisbury House, London Wall, E.C.

Stolz Electrophone Co. (1914), Ltd. (136,274).—This company was registered on June 6th, with a capital of £5,000 in 4,995 ordinary shares of £1 each, and 100 founders' shares of 1s. each, to carry on the business of manufacturers of and dealers in electrophones, devices and instruments to improve hearing and aiding the deaf to hear, aural instruments, &c., and to adopt an agreement with the Stolz Electrophone Co. (1913), Ltd., in liquidation. The subscribers (with one share each) are:—F. M. Billson, 17, Morley Road, Lewisham, S.E., clerk; G. J. Humphreys, 26, Roding Road, Clapton Park, N.E., clerk. Private company. The number of directors is not to be less than two or more than five; the first are S. M. Hyman, A. Hyman and J. Goldstein; qualification, 100 ordinary shares. Registered office, 8, St. Martin's Place, Trafalgar Square, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Rugby Lamp Co., Ltd.—A memorandum of satisfaction in full on March 5th, 1914, of mortgage, dated November 30th, 1908, securing certain sums up to £1,500, has been filed.

Spagnoletti, Ltd.—Mortgage deb. dated April 28th, 1914, to secure £3,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Park Royal Engineering Works, Ltd., 34-36, Gresham Street, E.C.

City of Oxford Electric Tramways, Ltd.—Mortgage dated May 11th, as collateral security to £46,000 debs., secured by trust deed dated February 20th, 1914, charged on certain land and premises in Leopold Street and Green Street, Oxford. Holders: Union Commercial Investment Co., Ltd., Dashwood House, 9, New Broad Street, E.C.

Lamplough & Son, Ltd.—Mortgage, created by the Receiver and dated May 14th, 1914, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: L. R. Rose, Summerfield, Cedar Road, Sutton, Surrey.

Apparatus and Accessories, Ltd.—Particulars of £1,000 debentures, created April 24th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, included uncalled capital. No trustees.

W. S. Laycock, Ltd. (68,203)—Capital, £150,000 in £1 shares (50,000 pref). Return dated February 24th (filed April 11th), 1914. All shares taken up. £50,007 paid on 7 ord. and 50,000 pref. £99,993 credited as paid on 99,993 ord. Mortgages and charges: £25,000.

Imperial Light, Ltd.—A memorandum of satisfaction to the extent of £2,400 on May 4th, 1914, of debs. created by resolution of November 7th, 1910, securing £5,000, has been filed.

I.T.E. Electric Co. (1907), Ltd. (95,222).—Capital, £1,000 in £1 shares · return dated March 20th (filed March 2nd, 1914); 107 shares taken up; £107 paid. Mortgages and charges: £2,400.

Lancashire Dynamo and Motor Co., Ltd.—Capital, £150,000 in £1 shares (50,000 pref.); return dated April 21st, 1914 (filed May 25th, 1914); 48,250 pref. and 97,700 ord. shares taken up; £145,950 paid. Mortgages and charges: £75,000.

Rushmore Lamps, Ltd.—Debenture dated May 27th, 1914, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: T. Estall, D. J. H. Cunnick and F. Eley, 15, Bishopsgate, E.C.

Auto-electric Transmission, Ltd.—A memorandum of satisfaction in full on May 6th, of debenture dated March 13th, 1914, securing £250, has been filed.

Ramsgate and District Electric Supply Co., Ltd.—Particulars of £20,000 debenture stock created February 10th, 1913, and secured by trust deed dated May 15th, 1914, filed pursuant to Sec. 96 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Underground Electric Railways Co. of London, Ltd.—Trust deed dated May 20th, 1914, to secure £700,000 4½ per cent. Three Year Secured Notes, charged on £463,000 4 per cent. deb. stock in London Electric Railway and £412,000 4 per cent. perpetual stock in City and South London Railway Co. Holders: Union of London and Smiths Bank, Ltd., 2, Princes Street, E.C.

Percy G. Green & Co., Ltd.—Particulars are of £1,500 debs., created May 26th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Tucuman Tramways, Light and Power Co., Ltd.—Trust deed, dated May 20th, 1914, to secure £400,000 5 per cent. deb. stock, charged on 7,800 ord. shares of $100 gold each, fully paid in the Campania Hidro-Electrica de Tucuman, all the issued shares of $100 m/n each fully paid in Campania Electrica del Norte & Co.'s other assets. Trustees: City dafe Deposit and Agency Co., Ltd., 13 and 15, Throgmorten Avenue, E.C., and M. W. Mattinson, K.C., 1, Garden Court, Temple, E.C.

CITY NOTES.

German Atlantic Telegraph Co.

THE report for 1913 of the Deutsch-Atlantische Telegraphen Gesellschaft, of Cologne, states that the traffic on the Atlantic cables again experienced an increase, although the growth in the number of words was attributed to the traffic at reduced rates, whereas a slight decrease took place in the fully-paid messages. The business on the Vigo cable also developed satisfactorily. The money transmission department was constantly expanding, and in addition to Luxemberg and Switzerland, Holland had now joined the service, and the connection of other countries was held in prospect. During the year a deep-sea interruption occurred in No. 2 Atlantic cable, the removal of which was much delayed by unfavourable weather. On the other hand, No. 1 Atlantic cable and the Vigo cable were not subject to any interruption in the year. The introduction of the Heurtley high-speed telegraph system was completed, the results having already been satisfactory, and they would probably be still better with further experience.

Alluding to wireless telegraphy, the report remarks that the principal activity of the system still consisted in the transmission of telegrams between ships and the coast and between vessels themselves, and that it had frequently become a feeder for cable messages. As the Governments of almost all cable-owning nations had established further submarine cables in the past year, and the cable companies in open competition had also laid large sections of new cables recently, it followed that wireless telegraphy was not destined to supersede cables in the transmission of telegrams.

The gross receipts from cable traffic and interest on investments amounted to £296,000 in 1913, as contrasted with £288,000 in the preceding year. After meeting general expenses and taxes, &c., the sum of £30,000 has been placed to the cable redemption fund, as in 1912, and £7,100 to the account of depreciation, as against £7,300 in the previous year. Including the balance forward, the net profits total £173,000, as compared with £166,000, and a dividend of 7½ per cent. has been declared on the ordinary share capital of £1,200,000, being the same rate as in each of the three preceding years.

Aluminium Corporation, Ltd.

THE directors' report for the 12 months ending December 31st, 1913, states that there is an increase in the gross profit, but an abnormally low rainfall during the year 1913 prevented a further increase being shown. The carbon works have now been completed at Dolgarrog, and are giving very satisfactory results. A contract has been placed for the construction of a dam and tunnel to bring the Dulyn Water into the Eigiau Lake. The maintenance of the machinery and plant in a high state of efficiency out of revenue has been continued, and no provision for depreciation has been included in the accounts. The value of the freehold land, water power, &c., appears at the same figure as last year, plus the additions during the year, and in view of the removal of the carbon factory from Wallsend, the directors have pleasure in stating that the figure they stand at in the books has been more than justified by an independent valuation. £1,295 preliminary expenses have been written off. After considerable negotiation arrangements have been made to define the exact value of the present participating shares by giving them the same rights and privileges as 40,000 preference shares, and an extraordinary general meeting has been convened, and will be held immediately after the close of the annual meeting on June 17th, for the purpose of passing the necessary formal resolution should the proposal be approved.

Peel-Conner Telephone Works, Ltd.—The directors report that for the year ended March 31st, 1914, the profit and loss account shows a net profit of £27,104. Out of this there has been placed to reserve for depreciation £5,000, and to general reserve £4,000, leaving £18,104 plus £3,555 brought forward. The balance available for dividend is £21,659. Interim dividends were paid on November 1st, 1913, as follows:—On the preference shares, £2,500; on the ordinary shares, £4,000. The directors recommend that dividends be now paid as follows:—Preference shares (balance) £2,500, 1s. per share on ordinary shares £4,000, and 1s. per share on ordinary shares (bonus) £4,000, leaving to be carried forward £4 659. The factory has been more fully employed during the past year, although not to its maximum capacity. This has resulted in an increased profit which enables the directors to recommend the payment of a bonus of 1s. per share on the ordinary shares in addition to the usual dividend of 2s. per share.

New British Ever-Ready Co., Ltd.—According to the *Financial Times*, the directors recommend a dividend of 1½ per cent. on the preference shares, making 8½ per cent. per annum for the 15 months to March 31st, 1914, and 8½ per cent. on the ordinary shares for the same period, placing £2,500 to general reserve, writing £3,686 off preliminary expenses, &c., £1,330 for depreciation and carrying forward £859.

The Bachelet Levitated Railway.—At a meeting of the directors, on Wednesday, it was decided not to proceed to allotment, and instructions were given to return the amounts received from applicants. The reason given for this decision is "the extremely disappointing result of the recent public issue." The publicity given in the columns of the daily Press to our criticisms of the project presumably contributed to this result, which, in the public interest, cannot be regarded as unsatisfactory.

Electric and General Investment Co., Ltd.—The directors announce further dividend for year to May 31st, making on the ordinary shares 10 per cent.; on deferred shares a dividend of 6d. per share is to be paid.

Constantinople Telephone Co.—At the annual general meeting held at the offices in Constantinople on June 4th, Mr. George Franklin presiding, the directors' report (see ELEC. REV., p. 832) was unanimously adopted.

Globe Telegraph and Trust Co., Ltd.—The directors have declared a final dividend of 6s. per share on the ordinary shares, making 6 per cent. for the year, carrying forward £25,700.

Manila Electric Railroad and Lighting Corporation.—The directors announce a quarterly dividend of 1¾ per cent. for the quarter ending June 30th on the common capital stock.

Brazilian Traction, Light and Power Co., Ltd.—The directors announce a dividend of 1½ per cent. for the quarter ended June 30th on the 6 per cent. cumulative preference shares.

International Light and Power Co., Ltd.—The directors announce a final dividend of 1½ per cent. on the preference shares for the quarter ending June 30th.

Provincial Tramways Co., Ltd.—An interim dividend of 8d. per share, less tax, upon the ordinary shares is announced.

Western Telegraph Co., Ltd.—Third quarterly interim dividend, 3s. per share, free of income-tax, for the year ending June 30th, 1914 (being at the rate of 6 per cent. per annum).

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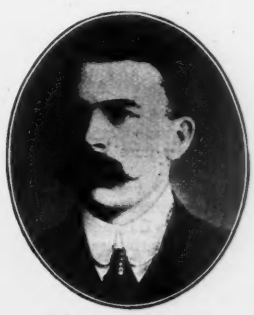
THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

THE BIRMINGHAM CONVENTION.

On Monday evening next the nineteenth Annual Convention of the I.M.E.A. will be opened by an informal reception and smoking concert to be held, by the invitation of the Birmingham Entertainments Committee, at the Grand Hotel, which will be the headquarters of the Council.

The proceedings, which will extend over the entire week, will be presided over by Mr. R. A. Chattock, city electrical engineer of Birmingham, who will deliver his presidential address on Tuesday morning after the official welcome by the Lord Mayor. On this and the following pages we give photographs of many of those who are either officially or in other capacities connected with the organisation this year. We also give information regarding some of the electricity works and manufactories that will be visited by the members during the Convention.

Mr. H. Richardson
(Vice-President).



Mr. A. C. Cramb
(Vice-President).

Mr. R. A. Chattock,
President.

Mr. G. Wilkinson
(Past-President).

Mr. W. W. Lackie
(Past-President).

Alderman G. Pearson
(Hon. Solicitor).

Mr. C. McArthur Butler
(Secretary).

Mr. H. Faraday Proctor
(Hon. Sec. and Past-Pres.).

Mr. J. E. Edgcome
(Hon. Treas. and Past-Pres.).

Photographs:

R. A. Chattock .. .. .. *Lafayette*
H. Richardson .. .. *Valentine & Co.*
G. Wilkinson .. .. .. *Rosemont*
G. Pearson .. .. *Abel Lewis & Son*

Photographs:

W. W. Lackie .. .. .. *Romney*
A. C. Cramb .. .. *Bender & Lewis*
J. E. Edgcome .. .. *G. T. Jones & Son*
C. McA. Butler .. .. .. *Corbett*

Mr. R. A. Chattock (*President*).—Mr. Chattock has been city electrical engineer at Birmingham for the past 11 years. Previously he was for three years chief electrical engineer at Bradford. He was born 49 years ago. His education at University College School, London, was followed by some years' training gained in marine and mechanical engineering works at Blackwall. His electricity supply service has been continuous since 1889, when he began a period of some years spent with the Metropolitan Electric Supply Co. at their several stations. Subsequently Mr. Chattock, for a brief period, held office as chief electrical engineer at Hampstead, and, after five years as superintendent engineer at the Bankside works of the City of London Electric Lighting Co., he accepted the Bradford post mentioned above. As leader of one of the foremost electricity supply systems in the United Kingdom, which is progressing by leaps and bounds, and is in the midst of important extension operations at the present time, he should make an excellent president of the M.E.A.

Mr. H. Richardson (*Vice-President*).—Mr. Richardson was educated at the City of London School. He served his mechanical apprenticeship with Messrs. Frank Ashwell & Co., of London and Leicester, and subsequently entered upon his electrical training with Messrs. Siemens Brothers & Co., and afterwards joined the National Electric Supply Co., at Preston, previous to taking up an appointment as assistant electrical engineer during the construction of the Newcastle-on-Tyne tramways. He left Newcastle to take up the position of chief electrical engineer to the city of Dundee. The Dundee electrical undertaking has undergone great change and development and, as a result, considerable improvement in economy and management has been attained. A new high-tension three-phase generating station was erected on the banks of the Tay, with sub-stations, and the whole of the designs and specification for this enterprise were prepared by Mr. Richardson. He is a Fellow of the Royal Society of Edinburgh, a Member of the Institution of Electrical Engineers, and a Member of the Institution of Mechanical Engineers. Mr. Richardson is a keen Territorial, and is in command of the City of Dundee Royal Engineers.

Mr. A. C. Cramb (*Vice-President*) who has been, for the past 10 years, chief engineer and manager of the Croydon electricity undertaking, was from 1902 to 1904 chief assistant in connection with the same system. Prior to that he had had a varied experience in connection with electricity supply work in Huddersfield and in several London stations, including Hampstead and Islington. He was born just forty years ago, and received his engineering training with a Newcastle firm and at the Erith works of Messrs. Easton, Anderson & Goolden.

Mr. W. W. Lackie (*Past-President*).—Mr. Lackie was born at Montrose in 1869, and was a student under Lord Kelvin at Glasgow University. He was with Messrs. Mavor & Coulson for four years, during which time public electricity supply in Glasgow was developed, until the undertaking was taken over by the Corporation; Mr. Lackie then transferred his services to the Corporation. For four years he acted as mains superintendent, and was appointed chief assistant engineer in 1898, when Mr. Chamen took office as chief engineer. In 1904 Mr. Lackie succeeded Mr. Chamen as "chief." During the past 10 years the capital expenditure of the undertaking has increased by over a million sterling, and now stands at £2,300,000. The revenue has increased from £186,000 to £345,000. The output has gone up from 21,000,000 to 77,000,000 units, and the number of consumers from 9,000 to 27,000. A large new generating station is now in course of construction, which will have an ultimate capacity of 140,000 KW. Last year, before approving of the plans of the new generating station, the Glasgow Corporation sent Mr. Lackie to America to see the switch-houses at Niagara and the power houses at Chicago and New York. Mr. Lackie was president of I.M.E.A. in 1909-10. He is a past chairman of the Scottish Local Section of I.E.E. and of the Scientific Society of the Royal Technical College, Vice-Chairman of the Institute of Engineers' Shipbuilders, and he is at present Chairman of the Glasgow University Engineering Society. Mr. Lackie is M.I.C.E., M.I.E.E., M.I.Mech.E.

Mr. John Christie (*Past-President*), is, of course, the popular borough electrical engineer at Brighton, where he took up the position of resident engineer and manager in 1900, becoming chief engineer and manager five years later when Mr. Arthur Wright resigned his post in the management of the undertaking. Mr. Christie is 46 years of age. He was one of Prof. Jamieson's day engineering students at Glasgow. Marine engineering service was followed by a period as assistant engineer with Messrs. Crompton, at Chelmsford, then a year with the St. Pancras electricity undertaking at its birth, and after experience gained in the testing department of Messrs. Siemens Bros. & Co., at Woolwich, he re-entered municipal electricity supply service in 1893, finding his way to Glasgow, Londonderry, and again to Glasgow until he came right south where at Brighton, as our readers know, he is engaged at present devoting himself with considerable enterprise to the cultivation of a cooking and heating load. He was president of the M.E.A. in 1911.

Mr. George Wilkinson (*Past-President*).—Mr. Wilkinson, who presided over the Harrogate Convention in 1912 is the engineer-in-chief of the Harrogate Corporation electricity undertaking. In addition, he is also responsible for designing the electricity works which are now in course of construction for the Ilkley Urban District Council. In his capacity as a consulting engineer he, further, has the works in hand for the Knaresborough Urban District Council.

Alderman George Pearson (*Hon. Solicitor to the M.E.A.*) is, we should say, one of the busiest men in Bristol. He was elected without opposition to represent Clifton Ward on the Bristol Town Council in the year 1888. He was chairman of the Boundaries Committee from 1889, when the work commenced, to 1897, when it was brought to a successful issue by the passing of the Bill through Parliament, and he became chairman of the Committee for bringing the Act into operation. He is now serving his 21st year as chairman of the Electrical Committee, and his legal knowledge and experience gained as a partner in the firm of G. Pearson & Usher, solicitors, has always been freely at the disposal of the M.E.A. He is also a member of many other committees concerned with public interests, as well as being chairman of the Joint District Board of Masters and Men for the Coalfields of Bristol under the Minimum Wage Act of 1912. The fact that in the midst of his multifarious other activities, Alderman Pearson is able to devote time and interest to the affairs of the M.E.A. says much for his appreciation of the importance of electrical affairs to the community. Alderman Pearson has been laid up for some weeks of late, but members of the M.E.A. will hope that he will be sufficiently recovered to attend the Convention at Birmingham.

Mr. J. E. Edgcome (*Hon. Treasurer and Past-President*).—Mr. Edgcome was born in the year 1865 and educated in London and Paris. After his engineering training he was with Messrs. R. E. Crompton & Co., Ltd., at Kensington Court power station, in 1887-8; with the Kensington and Knightsbridge Co., Ltd., in 1889-90; the Notting Hill Co., Ltd., from 1890 to 1893; and was appointed borough electrical engineer and advising engineer to the Drainage Committee of the Corporation of Kingston-upon-Thames in 1893. He is a member of the Institutions of Mechanical and Electrical Engineers, was on the Executive Committee of the Olympia Electrical Exhibition, 1907. An original member of the I.M.E.A., he has twice served as President, in 1906 and 1913, as Vice-President twice, as Hon. Secretary, and he is at present Hon. Treasurer. Mr. Edgcome is a Member of the Standing Committee on Wiring Rules of the I.E.E., and is President of the Diesel Engine Users' Association.

Mr. H. Faraday Proctor (*Hon. Secretary and Past-President*).—At the time of his appointment as chairman of the Western Local Section of the I.E.E., we published a brief account of the career of Mr. Faraday Proctor (ELECTRICAL REVIEW, November 7th, 1913). For more than 21 years he has been connected with municipal work. He was one of the founders of the I.M.E.A. some 18 years ago, and was president in 1898-9. He has occupied a seat on the Council continuously since that date. He is city electrical engineer of Bristol, and is 47 years of age.

Mr. C. McArthur Butler (*Secretary*), has been Secretary of the I.M.E.A. since 1899, and, as its executive officer, has been responsible for organising the annual Conventions held in Glasgow (two), London (three), Sunderland, Derby, Edinburgh, Sheffield, Nottingham, Manchester, Brighton, Harrogate, and the forthcoming one in Birmingham. He is a Fellow of the Chartered Institute of Secretaries, an Associate of the Institution of Electrical Engineers, and a member of several other professional bodies.

Mr. Frank Ayton (*Member of Council*).—Mr. Ayton served as a pupil for three years at the Woolwich works of Messrs. Siemens Bros., entering these works in 1889, and he was subsequently taken on the staff. He served on the deck engineering staff of the two expeditions connected with the laying of the 1894 Atlantic cable for the Commercial Cable Co., and the 1896 expedition connected with the laying of the cable up the River Amazon. He was employed as an assistant in connection with the inauguration of electric supply at Derby in 1893-4. During the latter part of his time at Woolwich works he was engaged in estimating for, and designing, central station schemes and tramways. In 1896 he was placed in charge of the railway and tramway work of the firm at their London office. While in this position he supervised the contract for the electrical equipment of the Waterloo and City Railway, the earlier stages of the equipment of the experimental section for electrical working on the Underground Railway between Earl's Court and Kensington High Street, together with the contract for the electrification of the Hull tramways, &c. In 1898 he left Messrs. Siemens to join the staff of Sir Alexander Kennedy. When Sir Alexander was appointed consulting engineer to the Ipswich Corporation, Mr. Ayton prepared the designs and specifications, and later on was appointed resident engineer to supervise the carrying out of the whole work. Before its completion he was appointed by the Corporation as the chief engineer and manager of the new electric supply and tramways departments, which position he continues to hold. Mr. Ayton is 40 years of age.

Alderman Bruce (*Member of Council*).—Alderman Bruce has been chairman of the Sunderland Corporation Electricity Committee from the commencement of the undertaking. He is a Sunderland man through and through. He was born there 72 years ago, educated there at the New Academy, became a Town Councillor in 1879, and an Alderman in 1896. He filled the office of Mayor in 1897 and 1898. In addition to his active interest in the electricity department, Alderman Bruce is also a Magistrate of the borough.

Mr. W. Wyld (*Member of Council*).—Mr. Wyld, of Hampstead, after serving a full mechanical apprenticeship entered the Blackpool Corporation electricity works. Subsequently he held the position of chief assistant to Salford Corporation electricity works, and was appointed chief electrical engineer to the Patent Shaft and Axletree Co., Ltd., of Wednesbury, where he designed and erected one of the earliest three-phase power station and works equipments in this country. Upon completing this work he was appointed electrical engineer to the Corporation of Doncaster, and whilst there was responsible for the electrical equipment of the tramway system, being subsequently appointed tramways manager. Later on Mr. Wyld was appointed general manager to the Birkenhead tramways, and after holding this appointment for three years, he was offered and accepted in addition the office of borough electrical engineer. After nine years at Birkenhead, he was last year appointed chief electrical engineer and manager at Hampstead, which position he now holds.

Mr. Thomas Roles (*Member of Council*).—Mr. Roles was born at Brighton in 1875, and, after receiving general and technical education there, he entered the service of Messrs. Crompton & Co. in September, 1892. There he was employed on work in connection with the plant of the Hove Electric Lighting Co., Ltd., and, on commencement of supply, he was transferred to the staff of that company. Between 1895 and 1897 he was assistant electrical engineer at Aberdeen, leaving to take up a position as draughtsman in the Leicester Corporation electricity department, and was soon promoted to the position of mains engineer. From 1900 to 1904 he held office as generating engineer at the Poplar Borough Council electricity works, and left there to become chief assistant electrical engineer to the Bradford Corporation. To the position of city electrical engineer and manager, which he now holds, he succeeded early in 1907. At Bradford he has greatly developed the extra-H.T. three-phase system of generation and transmission. Mr. Roles has at present in hand extensions involving an outlay of nearly £100,000. The total capital expenditure on the Bradford electricity undertaking now exceeds £925,000, of which over £400,000 has been expended during Mr. Roles's period. He has paid considerable attention to the development of the business side of the undertaking, including the extension of the motor, arc lamp and accessories-hiring department, opening of showroom, &c. He has instituted a specially low scale of charges for power supply with the result that a number of weaving sheds and spinning mills are now solely dependent on the Corporation electricity supply for their power. The total number of units sold during the year ended March 31st last exceeded 28,000,000, as compared with 14,500,000 units in 1907. For domestic purposes, a ·5d. tariff has been in operation since July, 1910, with great success. Mr. Roles was one of the founders of "The Point Fives" Association, and he has been unanimously elected chairman of the Yorkshire Local Section of the I.E.E. He is at present engaged, in conjunction with the B.E.A.M.A., in promoting an Electrical Exhibition to be held in Bradford in October next.

MR. F. AYTON.

MR. W. WYLD.

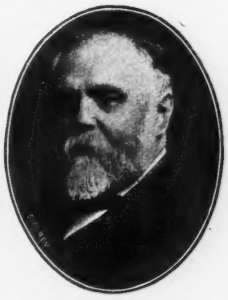
MR. S. L. PEARCE.

MR. A. H. SEABROOK.

ALD. SINCLAIR.

COUNCILLOR SMITH.

COUNCILLOR GIBSON.



COUNCILLOR W. BRUCE.

BAILIE JAMES WILLOCK.

*MR. W. A. VIGNOLES.

*MR. J. H. BOWDEN.

*MR. S. E. FEDDEN.

MR. S. J. WATSON.

PHOTOGRAPHS: W. Wyld, *Foulds & Hibberd*; S. L. Pearce, *Guttenberg*; W. A. Vignoles, *Sherlock*; S. E. Fedden, *Kingham*; Councillor Smith, *Bentley*; Ald. Sinclair, *Chapman*; Councillor Gibson, *Treble*; Councillor Bruce, *Elliott & Fry*.

* Authors of Papers.

Councillor A. G. Ellaway (*Member of Council*), was born in 1864. He early entered his father's business of brass-founder, which he took over at his father's death in 1887, and still carries on under the name of Henry H. Ellaway, at Essor Works, Birmingham. He was brought up in a political atmosphere. His father was a councillor and alderman before him, and Mr. Ellaway has taken part in public affairs since he was 18 years of age. He has served on the City Council since 1898, and in 1899 he took a seat on the original Electric Supply Committee when the Corporation acquired the undertaking from the company. He now holds, and has done since 1904, the position of chairman of the Electricity Committee. He was appointed on the first Tramway Committee in 1900, and is now its only original member. He is also a representative of the City Council on the Council of the Birmingham University.

Mr. S. J. Watson (*Member of Council*).—Mr. Watson is the chief engineer and manager of the Bury Corporation electricity undertaking. He is a member of the Institution of Electrical Engineers.

Mr. S. L. Pearce (*Past-President and Member of Council*).—After completing his practical training and the theoretical studies at the Finsbury Technical College, Mr. Pearce held positions with the Metropolitan Electric Supply Co., London, the British Thomson-Houston Co., Ltd., London, and the Central London Railway. He was appointed deputy chief electrical engineer in Manchester in 1901, and in 1904 succeeded Mr. Metzger as "chief." He has been responsible for all new work in connection with the Manchester undertaking, and during his period as "chief" the K.W.D. of the system has risen from 17,290 to 49,897, and the output has advanced from 28,966,000 to 117,929,000 units per annum. Mr. Pearce is now engaged on the design of the new Barton power station, the ultimate capacity of which is expected to reach not less than 120,000 KW. He held the position of Chairman of the Manchester Local Section of the I.E.E. in 1905/6, was President of the I.M.E.A. in 1908/9, and President of the Institution of Civil Engineers (Manchester Association of Students) in 1913-14. He has served three terms on the Council of the I.E.E., and has also taken considerable interest in the proceedings of the Manchester Association of Engineers, serving on the Council of that body. He has taken an active interest in the formation of the Manchester Engineers' Club, and has served on the Committee since its inception. He is now a member of the Organising Committee which is endeavouring to formulate proposals for bringing together all the scientific and technological institutions in Manchester. Mr. Pearce has recently given evidence before the Board of Trade Committee on the use of Bitumen Cables, and before the Special Electricity Committee of the London County Council on London's Electricity Supply.

Mr. A. Hugh Seabrook (*Member of Council*).—Mr. Seabrook has for the past five years been general manager of the St. Marylebone electricity undertaking, during which time the output has nearly doubled, advancing from 9,000,000 to 17,000,000 units per annum. The maximum number of consumers has increased by 50 per cent., and the maximum load by 50 per cent., while the financial result has been changed from a deficit to a surplus. Mr. Seabrook is, perhaps, best known by reason of the close attention that he has given to the management and development of electric supply undertakings. At Marylebone the principal business is in domestic supplies—especially heating and cooking. During the past three years the connections to mains for heating and cooking have increased from 2,700 to 8,600 KW. During his three and a half years as general manager of the West Ham electricity undertaking, which position he held prior to taking up his present post, Mr. Seabrook was able to show figures of development and financial results three or four times better than during the five years in Marylebone. The restrictions in development were far less in West Ham than in Marylebone. Mr. Seabrook has always held that if we could not fix tariffs so as to make the cost of the service competitive with that of similar services by other agencies, neither a great amount of business nor financial success could result. On this ground he has always endeavoured to get tariffs fixed, not necessarily low, but on a competitive basis.

Mr. S. E. Fedden, city electrical engineer of Sheffield, is to contribute to this year's meeting (on Wednesday at Coventry) a paper on "The Design and Operation of Modern Boiler House Plant." Mr. Fedden is a past-president of the Association, and is 47 years of age. Prior to taking up his appointment at Sheffield in 1900, he had had a lengthy and varied experience in railway, electric supply, tramways and other branches of engineering in this country, Canada and the United States; Edinburgh, Greenock and Broughty Ferry electricity departments were the scenes of his labours on the way to his important office at Sheffield. The extent of his operations in the latter city, both technically and commercially, are already well known to readers of the ELECTRICAL REVIEW. Some ten years ago the Sheffield Corporation sent him to Canada and the United States, as the result of which he prepared a voluminous and instructive report on electrical practice, which we published in our pages at the time.

Councillor James Willock (*Member of Council*) has been a member of the Glasgow Town Council for 20 years, during the whole of which period he has been a member of the Electricity Committee. As chairman of that Committee he saw the capital grow from £150,000 to about £2,000,000. His retiral from the chairmanship after eight years was the result of the operation of a standing order of the Corporation that no member should hold a convenership for more than three years. Councillor Willock has always taken a keen interest in the M.E.A., and he has been present at practically every annual Convention of the Association. For many years he has been a member of Council. He has taken an active part in the various movements which have had for their object the popularisation and the more extended use of electrical apparatus. Councillor Willock has served for three years as a magistrate of the city of Glasgow, and now holds the honorary position of Master of Works. His business is that of a coal merchant.

Councillor Richard Gibson (*Member of Council*) is chairman and managing director of the Messrs. Baker & Crockett, Ltd., hardware merchants and brassfounders, of Wolverhampton. He is 72 years of age, and was initiated into masonry in 1864. He is interested in many public movements in Wolverhampton, and as a member of the Corporation he has devoted himself to the work of various Committees. He is chairman of the Wolverhampton Electricity Committee.

Mr. W. A. Vignoles, who will read a paper on "The Commercial Development of Electric Supply in Towns of Moderate Size," at Birmingham on Tuesday, is chief electrical engineer to Grimsby Corporation. He was born in London in 1874, and educated in France and at Finsbury Technical College. He was entered as an apprentice with W. T. Goolden & Co., who were then specialising in mining and electrical coal-cutting work. For another company he was in charge of the cutting plant at various collieries in Durham for about 12 months. Subsequently he became head draughtsman with Messrs. Crompton & Co., going later to Sir Alexander B. W. Kennedy, F.R.S., with whom he was for some time in his London office, afterwards acting as his resident engineer during the construction of the Grimsby Corporation electricity works. In 1901, when the Grimsby works commenced to supply, he became borough electrical engineer, and he holds this position still. He has designed and carried out all extensions of plant since 1902. Mr. Vignoles made a number of experiments some years ago in connection with fuel economy. In 1906 he read a paper at the I.M.E.A. on the same subject. He has devoted a great deal of attention to the commercial development of electricity undertakings and to publicity work. Mr. Vignoles is a brother of Mr. E. B. Vignoles, of Evershed & Vignoles, Ltd.

Mr. J. Horace Bowden, who will regale members at Stratford-upon-Avon on Thursday with his views on "Standardisation of Tariffs," is still, as we say, "on the right side of 40." He is the borough electrical engineer and manager at Poplar, where the undertaking has made excellent progress during the 9½ years that it has been under his care. For 17 years he has been continuously in responsible control of electric light and power systems in London, his experience before going to Poplar having been with the South Metropolitan E.L. & P. Co., Ltd., and Brompton and Kensington Electric Supply Co., Ltd. In respect of capital expenditure, Mr. Bowden claims a record in the Metropolitan area—£33 per KW. installed. His output for 1912-13 was just over 12 million units, and the estimate for 1913-14 was in the neighbourhood of 17 millions. He claims to have introduced the 5d. system of charging, and since the initiation of that system at Poplar the demand has increased enormously, the present rate of increase being 3 million units per annum, compared with 1 million in previous years. Mr. Bowden has been president of the Associated Municipal Electrical Engineers (Greater London), was first chairman of the Point Fives, and was organiser of the conference considering the linking up of the various London undertakings.

Lieut.-Col. Alex. Sinclair, V.D. (*Member of Council.*)—Alderman Sinclair, of Swansea, is perhaps one of the most familiar figures at M.E.A. gatherings. He has attended the annual Conventions every year since in 1902 he became chairman of the Swansea Electric Lighting and Tramways Committee. As a member of that Committee he took an active part in the inception and carrying out of the electricity undertaking. He has been a member of the I.M.E.A. Council since 1903. Col. Sinclair was born in Aberdeen, Scotland, in 1861. After being some time abroad he, for five years, studied electrical and general engineering. In the early eighties he took part in the lighting, electrically, of several houses in London and neighbourhood, among these being that of the late Sir George Newnes, under Messrs. Goolden & Trotter. In 1883 he joined Messrs. Siemens Bros., as assistant electrician, taking part in the manufacture of the Mackay-Bennett Atlantic cable, and assisting in its laying by the cable ship *Faraday*. In 1885 he was appointed electrical engineer and manager of the works to Messrs. Vivian & Sons, copper manufacturers, Swansea, which position he still holds. He is a member of the Institution of Electrical Engineers, and an Associate Member of the Civils. For 27 years he has been an ardent member of the Volunteer and Territorial Forces. He recently retired with the rank of Lieut.-Colonel from the sixth battalion of the Welsh Regiment.

Councillor J. P. Smith (*Member of Council*) received his training as an engineer with Messrs. Storey Bros., of Lancaster. He was elected a member of the Barrow Corporation in 1891, and as an alderman in 1903. He has twice filled the office of Mayor—1901-2 and 1911-12—and has been chairman of the Electricity Committee from its commencement. He is an Associate of the Institution of Electrical Engineers.

Mr. C. Furness, city electrical engineer and manager at Blackpool, is also a member of the I.M.E.A. Council.

I.M.E.A. Visit to Birmingham.—As a modern switchgear works will doubtless be of interest to many, Messrs. J. H. Tucker & Co. extend to municipal engineers and other interested visitors to Birmingham a cordial invitation to visit their works on any day of the Convention week, except the Saturday (when they are closed for the works' annual outing), and see the making of "Tucker switches." The works are easily accessible by train or tramcar, and can be reached in about 20 minutes from the centre of the city. To facilitate matters for visitors, the company have arranged for the display in the principal hotels, &c., in Birmingham, of a wall sheet, giving the routes and times of trains to "Tuckers' Works." A notification by 'phone or otherwise of intending visits will be appreciated.

THE COVENTRY ELECTRICITY WORKS.

The Corporation Electricity Works, which form the subject of a visit on Wednesday next, were started in 1895, with a single-phase 87-cycle rope-driven plant. All this plant has, of course, been scrapped, and it is worth

The Coventry Electricity Works, from the Canal.

noting that the original engine room, at one time filled by plant having a total capacity of 750 kw., now accommodates some 11,000 kw. of plant.

In 1902 the conversion of the supply from single-phase to a two-phase 50-cycle system was commenced, McLaren marine-type triple-expansion engines with self-contained condensing gear being installed for driving 2,000-volt alternators of the fly-wheel type at moderate speeds.

Altogether four 600-kw. and two 800-k.v.a. generating sets of this type were installed, with generators by the British Schuckert Co., Siemens, and British Westinghouse Co., and these are still in use, although naturally the later and larger plant installed carries the bulk of the load.

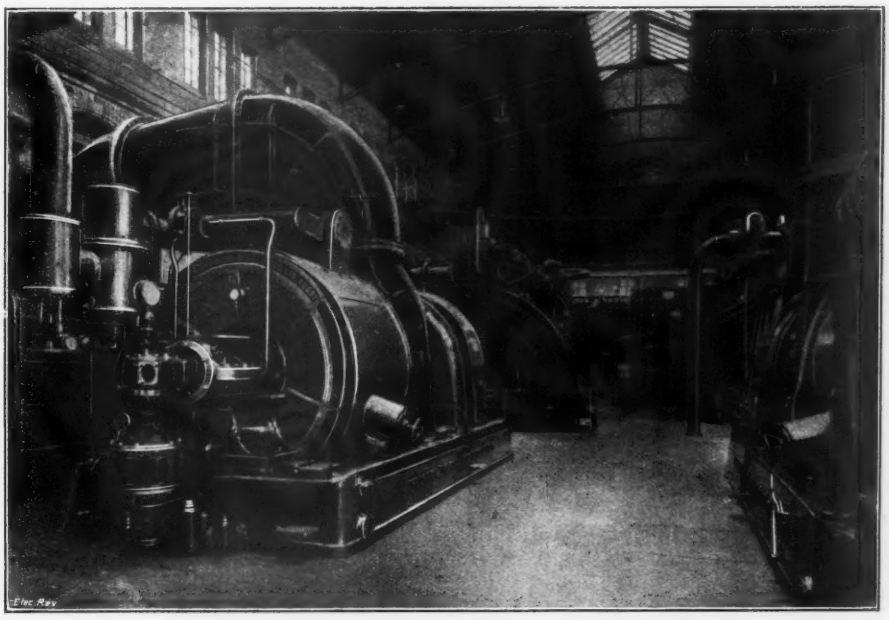
In 1910 the first of three B. T. H. horizontal Curtis turbo-alternators was installed. These machines are all similar, each having an output of 2,750 k.v.a., two-phase, at 2,100 volts, with a ·8 power factor, when running at 1,500 r.p.m. Worthington condensers and pumps are provided, the arrangement of the plant being somewhat novel, as, on account of the water-bearing strata being only some 6 ft. or 7 ft. below the engine-room floor level, the condensers were placed beside the turbines and coupled to the latter by overhead exhaust pipes. The air and circulating pumps are electrically driven, and the circulating water, obtained from the adjoining canal, is cooled by means of four Worthington steel cooling towers which have been installed some distance from the station, on the canal bank. The four towers deal with 250,000 gallons of water per hour.

The switchgear has recently been remodelled by the British Westinghouse Co., and is of the remote-controlled

The Boiler House, Coventry.

mechanically operated type, with the control panels on galleries situated over the switch cubicles.

The switchgear is of the double-pole automatic oil-break type, no switching being effected on the neutral conductors, which are permanently earthed. The feeder overload relays are fitted with definite and adjustable time-limit elements. The machine relays are of the instantaneous reverse-current type. The last extension of the switchboard, which now occupies two galleries at right-angles, enabled the older board to be converted into a feeder board in two sections supplied through group switches from the extension board, to which the turbo-generators have been connected. The auxiliary circuits on these boards are supplied from a small 100-volt battery.



Interior of the Engine Room, showing B.T.H. Turbine Units and Reciprocating Plant.

The boiler house contains eight Babcock and four Lancashire boilers, fitted with chain-grate and sprinkler

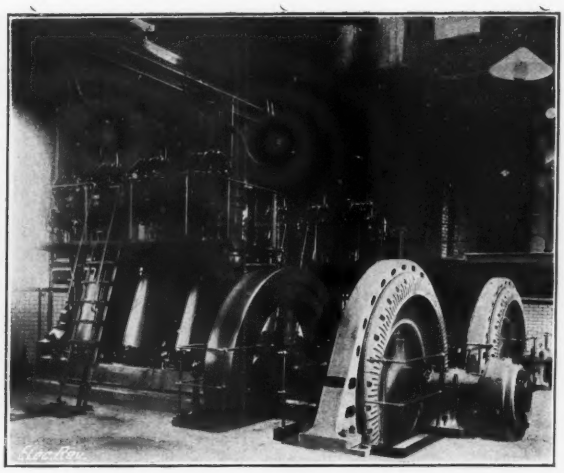
stokers respectively—all of the Bennis type, and the same firm also supplied the coal-handling plant.

Local water-borne coal is used, delivered from canal barge to conveyor, automatically weighed, and mechanically transported to the various bunkers and boiler hoppers.

As our readers are aware, Coventry is a flourishing centre of the motor-car and cycle industries, and of the 16½ million

In concluding this brief reference to the Coventry undertaking, it should be mentioned that the "all in" generation, distribution and management cost of ·346d. per unit sold constitutes a record certainly for municipal stations, on which Mr. Tough, the borough electrical engineer, is to be congratulated. The financial charges, at ·307d. per unit sold are also on the low side, thanks to the wisdom of the

THE COMPONENTS SHOP.



THE POWER HOUSE.

THE DAIMLER WORKS, COVENTRY.

units sold last year, nearly 15 millions were supplied at power rates.

Large power consumers obtain their supplies from sub-stations erected on their own premises, and the equipment has to be purchased by the consumer before he becomes entitled to bulk-supply rates.

The general distribution in the town is effected through static sub-stations equipped with either 50-KW. single-phase or 100-KW. two-phase transformers, usually at 200 volts.

During the last five years the load factor of the supply has gradually fallen from 25 to 20 per cent., due, we understand, to the increased lighting load, particularly in the large works, which are unlimited in this respect on power rates. Considerable development is also taking place in domestic lighting, which, at the present price of 3½d. per unit, appeals to the smaller consumers.

Coventry Corporation in past years, in utilising the surpluses of the undertaking in its development and thus relieving the capital account. It appears that altogether considerably over £50,000 has been utilised in this way since 1907.

THE DAIMLER CO., LTD.

THIS well-known firm of motor-car manufacturers have very extensive works in Coventry, containing some 16 acres

THE ERECTING SHOP, DAIMLER WORKS, COVENTRY.

of floor space and employing close upon 4,000 men. The chief departments consist of the foundry, machine and fitting shops, erecting, coach building, and the testing and delivery departments. A laboratory for chemical and physical testing, and a department for the mechanical

testing of all the materials employed are features of the works.

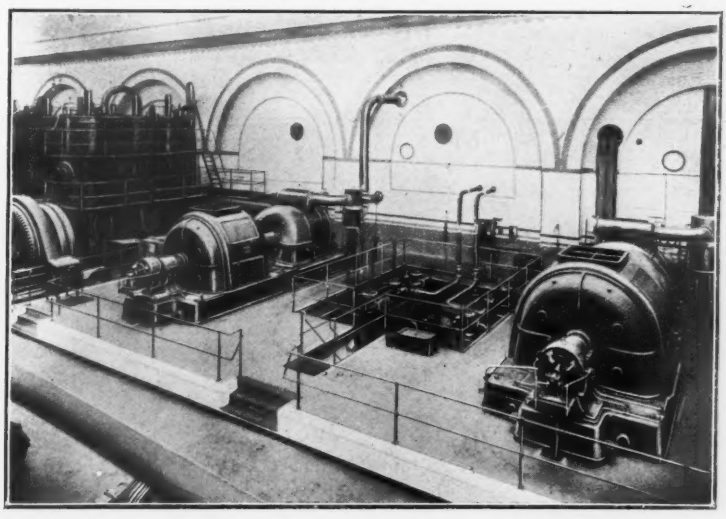
The tool shop alone employs some 200 men.

Electrical power is used exclusively throughout the works, the group drive being generally adopted, although some 40 or 50 machine tools are individually motor-driven.

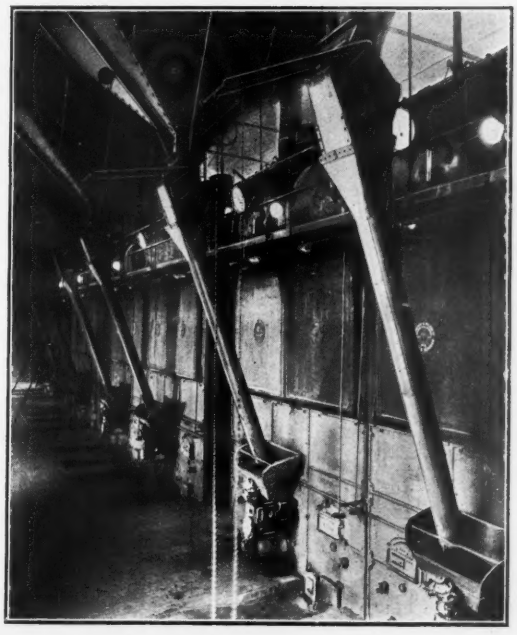
At the Coventry works, power is supplied from the company's Diesel engine plant of 1,100 B.H.P., and a two-phase bulk supply is also taken from the Corporation, being fed to an 18-panel change-over feeder board in the power house. This branch of the company's works practically adjoins the Corporation electricity works; the more recent works at Radford, a short distance away, are supplied entirely from the Corporation mains, upwards of 5 million units per annum being taken by the combined works. Lack of space precludes our referring at length to the manufacturing processes employed, but some idea of the magnitude of the company's business can be gathered from our view in the erecting shop, which is 1,000 ft. long and 160 ft. wide.

A repair department is carried on as a separate organisation, with its own machine tools, &c.

We are indebted to the Daimler Co. for the views here given.



5,000-KW. TURBO-ALTERNATORS, SUMMER LANE STATION, BIRMINGHAM (see p. 999).



NEW BOILER PLANT, BIRMINGHAM!(see p. 999).

THE GENERAL ELECTRIC CO., LTD.

IT is probable that very few of those visiting the Convention will need any introduction to the General Electric Co., whose manufacturing headquarters at Witton will be visited during the week.

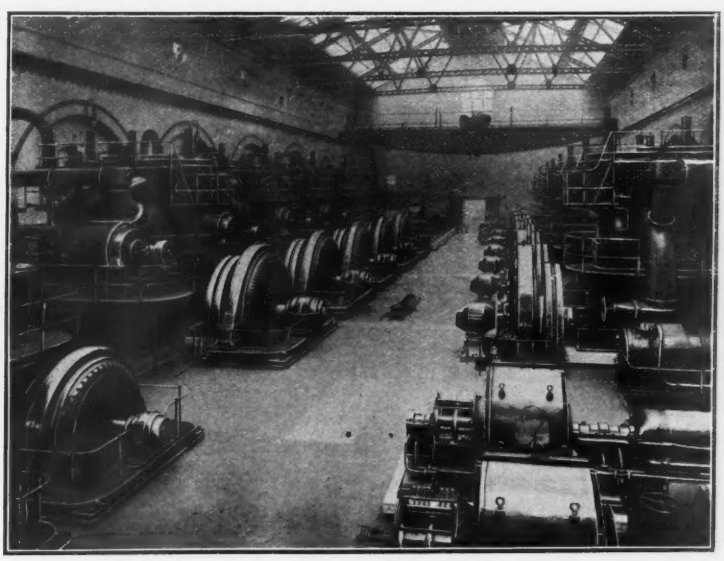
The Witton establishment embraces the engineering shops devoted to the production of large and small electrical plant of all descriptions; departments for switchgear, fans, &c.; a carbon works and conduit works; a power house, with 1,250 KW. of plant for driving the machinery in the works and an adjoining test house. A foundry provides the greater part of the castings used in the works, and the central stores, a three-storey building 350 ft. long, which accommodates stocks of the products of the various factories and facilitates their rapid dispatch to the company's numerous branches, is quite a feature of G.E.C. organisation.

The company are large manufacturers of electric light fittings and heating and cooking apparatus, this branch of the business, however, being carried on at another works in Birmingham. There are also associated factories in Manchester for the production of meters, circuit-breakers, telephonic and telegraphic apparatus, in London for lamps and accessories, and in Southampton for the manufacture of cable, the extent of the firm's business operations being indicated to some extent by its employing some 10,000 people.

Extensive alterations are being made at the Witton Works; a new bay to the engineering shop is projected, while other buildings, including a new test-house, mica shops, &c., are in course of construction.

The meter works will shortly be moved from Salford to a large building to be erected between the present engineering shops and the central stores.

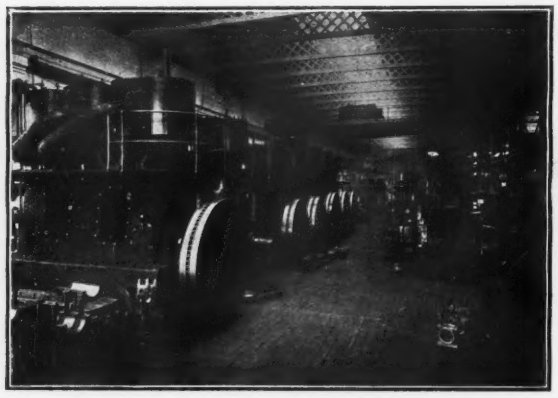
The carbon factory is a particularly interesting branch of the company's business, which, as is well known, was estab-



GENERAL VIEW, SUMMER LANE STATION, SHOWING ENGINE SETS EQUIPPED WITH EXHAUST TURBINES ON THE LEFT (see p. 999).

lished in the face of great difficulties, and is, in point of fact, the only arc lamp carbon works in the United Kingdom.

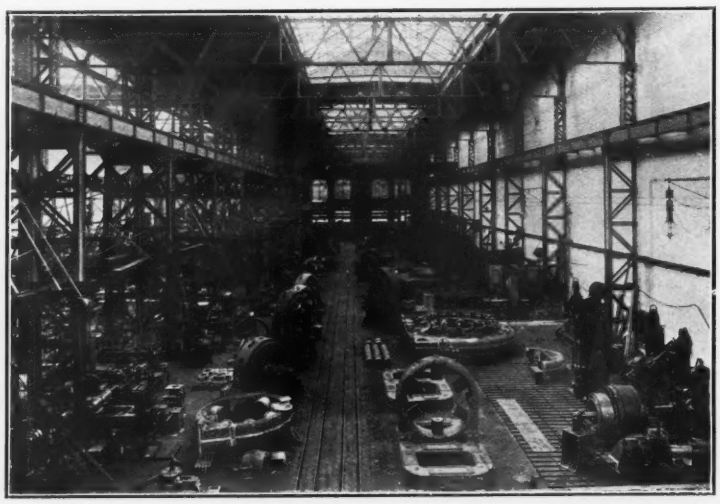
In addition to arc lamp carbons, special machinery has been installed for making battery carbon plates for Leclanché and dry batteries, and a chemical laboratory is provided here for obvious reasons. No reference to the Witton Works would be complete without some mention of the well-equipped club-house, known as the Magnet Club, where dinners and teas are served, and billiards and other recreations are provided. The social side has at all times been cultivated by the company, and facing the works are very large playing fields for cricket, football, &c.



Erecting Shop.

Machine Shop.

TYPICAL VIEWS IN MESSRS. BELLISS & MORCOM'S WORKS.



LARGE ENGINEERING SHOP, GENERAL ELECTRIC CO.

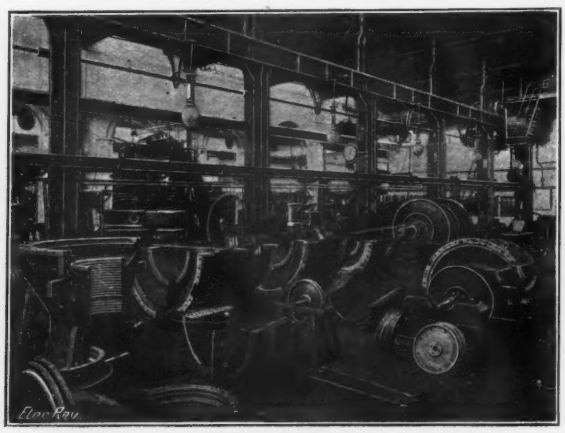
It is difficult to realise that these varied G.E.C. industries and the surrounding property have sprung into existence in the short space of 14 years, occupying land which prior to that time was given up to the rural occupation of cattle grazing. Through the courtesy of the company we are able to illustrate the large engineering shop at Witton Works, detailed descriptions of which have appeared from time to time in our pages.

MESSRS. BELLISS & MORCOM, LTD.

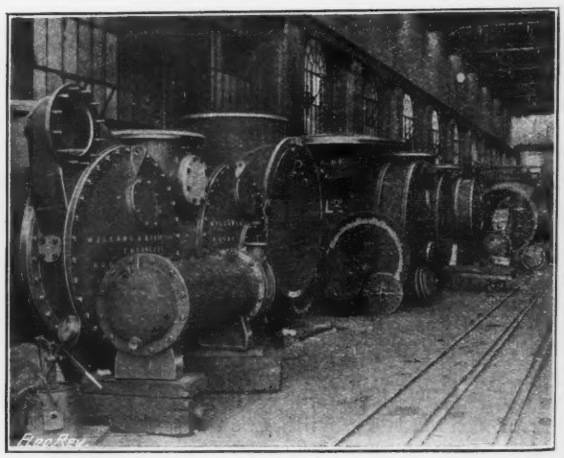
THE well-known firm of Belliss & Morcom, whose works are to be visited next week, have for many years been intimately connected with central station work, through the popularity of the Belliss high-speed engine.

This type, no doubt, owes its successful development to the early experience of the firm in the construction of machinery for torpedo boats and destroyers, a branch of business now given up.

The firm builds extensively both high and low-pressure air-compressing plant, and auxiliary machinery for central stations and naval vessels, but greater interest attaches to the more recently added branches of the business, in the making of steam turbines, paraffin and crude oil engines.



Turbine Department.



Condenser Bay.

TYPICAL VIEWS IN MESSRS. WILLANS & ROBINSON'S WORKS.

It is some 10 years since the firm took up the question of turbine building for electrical work, and the progressive improvements introduced during this period have enabled them to put on the market a turbine which

is at least as satisfactory as any other machine of the kind. The Belliss turbine is of the impulse type, and it has been the endeavour to give it as good a name for reliability as the Belliss engine.

The firm's older works at Ledsham Street have been reorganised, and are employed in the manufacture of small machinery. The larger engines and turbines, which form the greater part of the firm's output, are constructed at works in Icknield Square. The latter contains capacious well-lighted shops, in which the whole of the machinery is electrically driven, and to which a compressed air service is provided by electrical compressors.

The works power station, containing the company's standard engines coupled to dynamos of 700 KW., is equipped with a view to most efficient operation; the power house has been extended and adapted for testing turbines up to the maximum capacity of the boilers, a large condensing plant has been installed for the same purpose, and special resistance tanks are provided for taking generator loads, where such machines are tested with the turbines.

Two special water brakes are in use, the larger one being capable of absorbing 3,000 H.P.

It may be interesting to note that a portable turbine is used for balancing turbine rotors at full speed in the open; all such rotors are balanced both statically and dynamically up to full speed before being inserted in their casings.

Messrs. Belliss do not generally advocate the use of high-pressure turbines for under 1,500 KW. in preference to their engines, but they build exhaust steam turbines down do 200 KW. An experimental turbine of this class used in conjunction with their shop engines has led to a saving of some 1,000 tons of coal per annum, although only of 200 KW. size. The various departments are arranged for the systematic progress of the work, and the erecting shop is served with six large travelling cranes with which engines up to 1,250 H.P. can be lifted bodily. Very complete testing equipment is provided for engine sizes of from 75 to 1,500 H.P., with steam pressures up to 250 lb. per sq. in., the steam being supplied by five water-tube boilers. The electrical equipment provides for pressures up to 10,000 volts, and the test-house provides berths for 12 engines at the same time, and the use of different steam pressures.

THE SUMMER LANE STATION, BIRMINGHAM.

THE Birmingham electric supply undertaking has a special interest for those attending the Municipal Electrical Convention, if only because its able chief engineer and manager, Mr. R. A. Chattock, is the honoured President of the Association this year.

It is, moreover, recognised that the extraordinarily rapid growth of electricity supply in Birmingham during recent years has introduced administrative and technical problems of an exceptional kind, and that, due to Mr. Chattock's skilful management, the undertaking is successfully coping with a situation which appears to be unique in this country.

In 1907 under 11 million units were sold; during the last year of working nearly 74 million units were sold. The year 1913 marked a jump from 40 to 63 million units sold, though this was due in part to the taking over of the supplies in areas recently added to the city.

The principal generating station in the city is at Summer Lane; its original equipment was described in our columns, and this has been extended from time to time until the buildings now accommodate some 36,500 KW. of generating plant.

One of our views (p. 997) shows the general appearance of the engine room, a well-known feature of which is the 12 large Belliss engines, half of which drive 1,500-KW. alternators, and are coupled to Belliss-Westinghouse exhaust-steam turbine sets mounted over the condensers—an arrangement which has nearly doubled the output of these units—while the other six are direct-current generating sets each of 1,500-KW. rated output. The latest addition to this station, however, is two 5,000-KW. B.T.H. turbo-alternators, our illustration showing the arrangement of this plant, and giving some idea of its size in comparison with the adjoining engine sets.

The turbines are of the Curtis six-stage type, and work in conjunction with Worthington condensing plant.

The generators are designed to take an overload of 25 per cent. for two hours, and to give an output of 7,500 K.V.A. at ·66 power factor. The exciters are direct-coupled, and the air-pumps steam driven by compound engines working in conjunction with an exhaust heater, through which the condensate passes to the hot-well tank.

The addition of the above plant rendered further boiler power necessary, and a separate boiler house was erected at the back of the original one, and on the same level as the basement of the latter.

This building, which we also illustrate, accommodates seven Babcock & Wilcox boilers, each with a rated evaporation of 24,000 lb. Underfeed stokers are fitted, working in conjunction with two steam-driven fans.

The conveyors to the older boiler house have been adapted to supply the bunkers which have been provided in the new building.

A prominent feature of the Summer Lane plant is the group of 12 steel Worthington cooling towers, now being supplemented by a Davenport wooden tower, which have been installed to cool the condensing water, in view of the limitations of the canal in this respect.

In order to keep pace with the demand, which is increasing at the rate of 5,000 KW. per annum, and pending the erection of the new station at Nechells, it has been decided to install a 5,000-KW. turbo-alternator with boiler plant, &c., at the Aston generating station.

The rapid extension of the supply has necessitated the provision of numerous sub-stations; 17 of these supply the public networks, and over 23,000 KW. of rotary converters are installed for this purpose. In addition, private consumers' sub-stations number over a hundred. In conclusion, we may add that some 48,000 KW. of feeders and trunk mains are connected to the Summer Lane station.

MESSRS. WILLANS & ROBINSON.

THE firm of Willans & Robinson—of Willans engine fame—removed from Thames Ditton to Rugby in 1897 when the present Victoria Works were started up.

During the years that have intervened, various extensions have been carried out and the scope of the firm's business has also completely changed, the leading products now consisting of steam turbines, Diesel oil engines, condensing plants and high-lift turbine pumps for collieries, waterworks, &c.

The works now give employment to from 1,000 to 1,100 men. They are driven by a Willans three-cylinder enclosed Diesel engine coupled to a 330-KW. Peebles generator, the introduction of which has, we understand, materially improved the firm's generating costs, which stand at ·6d. per unit with oil at 80s. per ton and a full maintenance and depreciation allowance.

Through the courtesy of Messrs. Willans & Robinson we are able to reproduce some views in their works. One of these shows the turbine blading shop, with parts of the 3,000-KW. turbines for the Perth (W.A.) Government station in the foreground.

A rotor for a 7,500-KW. turbine for Leeds is also shown, and it may be of interest to mention that a 3,000-KW. turbine is under construction for Canadian purchasers, which is designed to run at 3,600 R.P.M.

As the standard Canadian frequency is 60 cycles, Messrs. Willans have prepared a special series of patterns for 3,600 R.P.M. turbines to meet that country's requirements.

It may be of interest to mention that the foundry is one of the largest in the Midlands, and a large number of castings are produced for outside engineering works, in addition to meeting the requirements of the works.

Another view illustrates a series of surface condensers in the erecting shop. We need only add, in conclusion, that the works are well worth the visit proposed on Wednesday afternoon next.

CITY NOTES.

(*Continued from page 990.*)

Brazilian Traction, Light and Power Co., Ltd.

ACCORDING to the financial papers, the report has been issued covering the period from the incorporation in July, 1912, to December 31st, 1913. The consolidation of the interests of the Rio de Janeiro Tramway, Light and Power Co., Ltd., the Sao Paulo Tramway, Light and Power Co., Ltd., and the Sao Paulo Electric Co., Ltd., which was undertaken in July, 1912, has been successfully carried out, and at December 31st, 1913, practically the entire share capitals of these three companies had been acquired by this company. The total share capital of the company issued at December 31st, 1913, was $114,177,200. The results of the company's operations since its incorporation have proved very satisfactory, as is shown from the following revenue statement;—Revenue from 18 months' operation (July 1st, 1912, to December 31st, 1913); revenue from securities owned, and under contracts with subsidiary companies, $11,266,138; interest on advances to subsidiary companies, $256,698; total, $11,522,836; less head office, general and legal expenses, interest, discount and exchange, $324,343; surplus available for dividends, $11,198,493; dividends Nos. 1, 2 and 3 on 6 per cent. preferred shares, at 1½ per cent. each, $150,000; dividends Nos. 1, 2, 3, 4 and 5, on common shares at 1½ per cent. each, $7,735,495; surplus carried to profit and loss, $3,012,997. At the conclusion of the year 1913 this company, after payment of a regular dividend at the rate of 6 per cent. per annum on its ordinary shares, carried forward a credit balance on profit and loss account of $3,012,997, apart from the credit balances of the general reserve funds and profit and loss accounts of the subsidiary companies. The combined reserves and surpluses of this company and its subsidiaries at the present time reach the total of $15,028,144, which have been expended on the development of the enterprises of the subsidiary companies. Large expenditures have been made in the development of the properties of the subsidiary companies during the last few years, so that they are in an excellent position to supply the demands of the public, which are bound to largely increase, and the result of the present year's operation should show a material increase in net income over the past year. The shareholders' attention is called to the satisfactory returns of the first few months in justification of this forecast. The combined net earnings from the operation of the businesses of the subsidiary companies for the year 1913 show an increase of $1,709,437 over the corresponding period for 1912. The meeting will be held at Toronto on July 3rd.

Bath Electric Tramways, Ltd.

SIR JAMES SIVEWRIGHT presided on June 4th at Winchester House, E.C., over the adjourned annual meeting for the consideration of the proposals of the directors circulated to the shareholders on February 19th.

The CHAIRMAN said they would recollect that on the occasion of the annual meeting he told them that the loan to the bank, which had been outstanding for a great many years and which they were gradually paying off out of revenue, had been practically called up. At the same time they saw the opportunity of using a certain amount of money in the lucrative business of motor cars, and so they submitted a scheme to the shareholders which was discussed and afterwards deferred to the meeting called that day. At the time the suspension of the preference dividend was proposed as a possible necessity, but he stated that the scheme had been framed on extremely drastic and conservative lines, and although he would not commit himself to a promise, yet he said he thought there was a very great possibility of the preference dividend not having to be suspended. He said that this would depend to a great extent on the weather, because the weather was the ruling factor in the case of tramways. Well, the weather had been very propitious and their business had gone on in a most satisfactory fashion, and he was in the happy position of being able to announce that, owing to the revenue having been much in excess of what he had anticipated, and owing to the action of the bank, the preference dividend would not be suspended. Seeing the way they had tackled the question, the bank had expressed their willingness to take a considerably less annual payment than they at first demanded. Now, therefore, they were in the position that they were in before, and they could pay their debenture interest and preference dividend and lay a substantial amount by. The scheme for the present, at all events, was dropped. A committee of shareholders was appointed to confer with the board, and some of them had been to Bath, and he asked them to report their views.

Dr. MOODY said that Mr. Roe and himself visited Bath and were accompanied by a personal friend, who was an electrical tramways expert. They visited the power house and enquired into a number of the company's subsidiary interests, and they formed a very unfavourable opinion of the company's undertaking. They met the board in London and they agreed to ask Messrs. Balfour, Beattie & Co., well-known tramway experts, to report on the system. These gentlemen had reported quite confirming the unfavourable view the committee held concerning the management of the company. He and Mr. Roe considered that the control had been most inefficient, and that the energies of the company were being frittered away in running a foundry. A meeting of the board and the committee was arranged to take place the previous day, when the committee would have had a suggestion to make as to the financing of the company. They wished to make sure, however, that the Board would endeavour to follow the suggestions made in the report of Messrs. Balfour, Beattie & Co. In a preliminary interview with the Chairman, however, they obtained from him a most remarkable statement. They heard that the board was so dissatisfied with the unfavourable report of Messrs. Balfour, Beattie that, without consulting the committee, they had asked another expert, Mr. Hamilton, of Leeds, to make a report. He ventured to think that such a procedure on the part of the board was most unwarranted. His belief was that the Board improperly sent Messrs. Balfour, Beattie's report to the manager at Bath, and the manager then suggested the calling in of some other expert, so that the management might be white-washed. That was a way of conducting business that his colleagues on the committee and himself were not accustomed to, and on that account they refused to consider the matter further with the board. They had had a most extraordinary statement from the Chairman that day. Two months ago a scheme was put before them which fundamentally affected the preference shareholders, who were asked to forego their dividend for a number of years. Now the Chairman came and told them that the position was changed, and that the preference shareholders would receive their dividend in future. It seemed to him that the sooner the board ceased to control their affairs the better. The committee had come to the conclusion that this was a concern in which the board were to a large extent managed by the staff at Bath. They had heard a great deal about the motor 'buses and the torpedo cars, but Messrs. Balfour & Beattie said they had not produced any profit, and, personally, he believed they were making a heavy loss on them. Messrs. Balfour & Beattie showed that the Bath undertaking was very much over-staffed and that they could make many economies.

Mr. ROE, who accompanied Dr. Moody to Bath, endorsed the remarks made by the last speaker, and spoke at some length on the past accounts of the company. He suggested that money had been frittered away in motor 'buses, a foundry, a tea shop and side-shows, which took up much of the manager's time which could have been better devoted to the tramway undertaking. He contended that the appointment of Mr. Hamilton to make a report was nothing less than scandalous, and hoped the shareholders would show their condemnation of such action by giving their proxies to men deserving of confidence.

Mr. TOPHAM, who moved the appointment of the committee at the last meeting, said they all ought to have the engineers' reports in their hands to see what they were. He agreed with Dr. Moody in regard to the "right-about face" turn of the board, but, on the other hand, surely Dr. Moody did not mean to infer that the report of Mr. Hamilton was not worth anything at all. He did not see how they could judge by the verbal statements of the committee, but they must have the reports and think for themselves.

After a further lengthy discussion, to which the Chairman replied, the CHAIRMAN said that there was nothing before the meeting, but the reports of the experts would be sent to the shareholders.

The meeting then ended.

Madras Electric Supply Corporation, Ltd.

THE annual meeting was held at 1, Queen Victoria Street, E.C., on June 3rd, Mr. JAMES GRAY (the Chairman) presiding.

The CHAIRMAN, in proposing the adoption of the report (ELEC. REV., p. 959), said that since the last meeting Mr. Walrond and Sir W. J. Cunningham had resigned their seats on the board. He (Mr. Gray) was elected to fill the vacancy caused by Mr. Walrond's resignation and his colleagues had done him the honour of appointing him Chairman. He had been a director of the Madras Tramway Co. since its incorporation, and he hoped that his knowledge of that undertaking would be of service in carrying on the administration of the Electric Supply Corporation. Important changes had also taken place in Madras, and the arrangements foreshadowed by the Chairman at the last general meeting had been carried out and the joint management of the two companies was inaugurated on the 31st December last. The directors regretted that the results for the year were unsatisfactory. The revenue accounts showed a debit balance of £5,309, and after adding debenture interest, less interest receivable and dividend on the tramway shares, there was a total loss of £10,526. In view of the report for 1912 and the Chairman's speech at the last general meeting, they were doubtless prepared for unsatisfactory results, but so great a loss could hardly have been expected. The troubles with the old plant, however, were even greater than was anticipated, and it was with the utmost difficulty that it was kept running at all. That was reflected in the item "Generation of electricity," the total costs whereof amounted to £34,511 as compared with £19,182 last year, an increase of 80 per cent., although the number of units sold increased only 27 per cent. The cost of generating per B.T. unit sold was 1.819d., which was made up as follows: Fuel 1.196d., oil .168d., wages and

salaries .240d., repairs .215d. When he told them that the cost of generating with modern plant of similar capacity would be considerably less than half of that they would appreciate why the results for the past year were so unfavourable. In view of the inefficiency of the old plant and the precarious position in which they would be placed if any further failure occurred, they had been constantly urging for the completion of the new plant. In addition, however, to delays incidental to a large contract of that kind, the contractors had been handicapped by difficulty in procuring supplies of local material, the starting of the first set having been postponed for many weeks waiting for fire-bricks for the boilers. In addition, erection had been retarded on account of illness among the European staff of the contractors. He could assure them, however, that the matter was receiving the closest attention of the management and everything possible was being done to expedite completion of the new plant. In order that the shareholders might have the latest information the consulting engineers cabled to Madras the previous day to enquire as to the rate of progress. They had that morning received a cablegram that a preliminary run of the first boiler and the first turbine would take place on the 6th inst. The second and third turbine would be completed on the 13th inst., and fire-bricks for the second and third boilers had been promised for the 24th inst., and if those promises were fulfilled those boilers would be ready for steaming on 14th July. The consulting engineers thought the preliminary tests should be completed by the end of July, when the whole of the new plant would be in beneficial use. The cost of distribution was less than last year, the maintenance and repairs to mains having been reduced. Management expenses did not show any reduction, the change not having been inaugurated until the end of the year. The credit side of the revenue account was more satisfactory, for although no serious efforts could be made to procure new consumers, the revenue increased 21 per cent. Their representatives in Madras had no doubt that as soon as energetic steps could be taken there would be a large development in the demand for electrical energy. Negotiations were proceeding with the Corporation of Madras for more street lighting, but having regard to the very high price of fuel the directors considered that the rate of 2¼ annas provided by the licence was in some cases insufficient, and they had applied to have that question referred to arbitration as provided by the Indian Electricity Acts. Further, in their opinion, the present flat rate to private consumers for light and power was too low, and in conjunction with the consulting engineers, Messrs. Merz and McLellan, they were considering what could be done to increase the rate, but they were not yet in a position to formulate a definite proposal, the conditions in Madras being somewhat exceptional. There was so much scope however for the reduction of costs that whether they decided to increase the rates for lighting or not they were satisfied that the present results could be greatly improved. Unfortunately they would only get the full benefit of the new plant for four or five months this year, but he was glad to say that under the new management the cost of generating with the old plant had been reduced and therefore they looked forward to presenting accounts for 1914 of a much more satisfactory character. The tramway business continued to develop satisfactorily. The traffic receipts in 1913 amounted to 644,201 rupees, being an increase of 7.71 per cent. on 1912, and down to the end of May this year there was an increase of 8.1 per cent. on the corresponding period of 1913. At the end of 1913 there was available for distribution, including the amount brought forward and after adding debenture interest and providing £7,000 for depreciation and renewals, the sum of £12,552. A dividend of 6 per cent. was paid on the preference shares and 5 per cent. on the ordinary shares, and the sum of £3,320 was carried forward. For 1912 a dividend of 4 per cent. was paid on the ordinary shares and £5,000 only was transferred to depreciation and renewals. The relaying of the permanent way with 90lb. rails and the renewal of the rolling stock would be completed this year, and the transfer from revenue to depreciation and renewals fund at the end of 1914 would, they expected, be considerably reduced. They had expended during the year £41,977 on capital, of which £34,229 was on new buildings and machinery. To enable them to complete the new installation it would be necessary to provide a further amount of capital on account of which they had issued since the accounts were closed £4,000 of 6 per cent. debentures, increasing the amount issued to £192,675, leaving £7,325 unissued and available when required. He regretted that he had not been able to submit a more encouraging statement, but they were confident that the company was now on the point of turning the corner and better times were in store for them. One thing he could say and that was that the directors and staff would spare no effort to put the undertaking at the earliest possible moment on a basis which would reflect credit upon themselves and what was of greater importance would provide shareholders with a return upon the capital which they had invested.

Mr. J. G. B. STONE seconded the motion.

In reply to questions the CHAIRMAN said that he was not at present able to say what the loss would be of replacing the old plant. Until the new plant was running, they were still doubtful as to what proportion of the old plant would be able to be beneficially used. Undoubtedly if the company were commencing now they would put in the plant that was now being installed, but at the time they put in the old plant he did not think that any firm of engineers would have recommended the present type of plant. At that time they had not sufficient knowledge of turbine plant.

The report was then adopted.

Birmingham District Power and Traction Co., Ltd.

THE directors report that the total revenue for 1913 from all sources was £126,416 compared with £115,698 for 1912. The expenses amounted to £64,158 compared with £55,590. After providing for all sums chargeable to revenue, including repairs, maintenance, sums payable to local authorities, and placing £4,000 to the renewals fund, there remains £58,259 plus £109 brought forward, making a total of £58,368. From this has to be deducted interest on loans £9,009, interest on debenture stock £17,880, leaving a balance of £31,478. Deducting debenture sinking fund £5,428 and dividend for the year on the 5½ per cent. cumulative preference shares £11,538, there remains £14,512. The directors recommend a dividend on the preferred ordinary shares at the rate of 3½ per cent. for the year £12,250, putting to reserve £2,000 and carrying forward £262.

The gross receipts from the tramways were £55,686 compared with £53,640 in 1912. The gross receipts from the lighting and power department amounted to £36,417, an increase of £6,942 compared with the previous year. The dividends received from investments produced £30,849, compared with £30,180 in 1912.

Expenditure on the capital account of the tramway undertaking was incurred during the year to the extent of £18,134, principally in the purchase of motor omnibuses for hire to the Birmingham and Midland Motor Omnibus Co., Ltd. Practically the entire capital of the latter company is owned by this company. A sum of £172,876, representing the book value of the Smethwick Electric Supply Undertaking, has been received from the Shropshire, Worcestershire and Staffordshire Electric Power Co. on the transfer in November last to that company of the Smethwick Electric Lighting Order, 1898, with the power stations, mains, etc., forming part of the undertaking. The amount so received has been credited to capital account and the deposit with the company of £212,091 10s. 8d. which appeared in the previous balance sheet has been repaid.

During the year the balance of £44,890 of the 4½ per cent. debenture stock of the company was issued to provide funds for the extension of the Smethwick power station pending the sale of the electric supply undertaking to the Shropshire Power Co., to finance the Birmingham and Midland Motor Omnibus Co., Ltd., and for other purposes. The total amount of debenture stock now outstanding is £418,528. In accordance with the trust deed, a sum equal to one per cent. of the debenture stock issued, together with an amount representing interest on the stock previously redeemed, was paid to the debenture trustees in July last and was applied by them in the purchase and cancellation of £6,055 stock.

The company holds 161,566 ordinary shares of £1 each in the Electrical and Industrial Investment Co., Ltd. A proposal has been made by that company to convert the ordinary shares of £1 each in that company into 7 per cent. preferred ordinary shares of 10s. each and deferred ordinary shares of 10s. each, in equal proportions, to which the company has acceded.

Increases have taken place in the traffic receipts of all the associated companies principally as a result of the continued good trade in the various districts served by the companies and the prevalence of exceptionally fine weather during last summer, and in all cases these companies have put larger sums to reserve.

The increase in the expenses is due to the higher cost of material and the increase in the rates of wages paid to the employees.

The electric lighting and power supply business having been sold to the Shropshire, Worcestershire and Staffordshire Electric Power Co., that company will in future supply the electricity required for working the company's tramways.

	1912.	1913.
Miles open :—		
Route miles	10.32	10.32
Single line	4.66	4.66
Double line	5.66	5.66
Passengers carried	12,159,739	12,582,839
Average rec. per passenger	.99d.	.99d.
Average exp. per passenger (apart from rent of line, etc.)	.53d.	.63d.
Proportion of expenses to receipts	53 p.c.	63 p.c.

The annual meeting was held on June 3rd at the Electrical Federation Offices, Kingsway, Mr. C. S. B. HILTON presiding.

In proposing the adoption of the report, the CHAIRMAN said the business again showed expansion in both branches, and although it had not been possible to recommend an increased dividend they had no reason to be dissatisfied with the position or with the outlook for the future. The receipts from the tramways showed an increase of £2,000, of which £400 was contributed by the parcels department, while running expense had increased by £1,300, of which £760 was accounted for by increases in wages and salaries. Repairs and maintenance had increased by £1,100, mostly caused by additional expenditure on rolling stock. Sundry receipts showed a considerable increase, which arose chiefly from the sum of £913 paid by the Birmingham and Midland Motor Omnibus Co. for hire of omnibuses. The number of passengers carried during the year increased by 420,000, but the expense per passenger and the ratio of expenses to receipts also showed substantial increases. The track, rolling stock and overhead equipment had been maintained in first-class condition during the past year, and negotiations were now proceeding with the Smethwick Corporation for certain improvements in the track which, if carried out, would permit of services being carried out on the main line and on the Bearwood Road line which it was hoped would result in increased traffic. On the electric supply side they had again the satisfaction of reporting steady progress; 10,150,473 units were sold during the year compared with 7,745,887 in 1912. The receipts increased by £6,941 and the profits amounted to £12,847 against £11,114 in the previous year. The higher cost of fuel which maintained throughout the year caused a considerable increase in the generating expenses, and in the

earlier months of the year under review they were still feeling the effects of the coal strike. That was the last time to which he would have to refer directly to the working results of the electricity supply side of the undertaking, as the whole of that undertaking had been sold to the Shropshire, Worcestershire and Staffordshire Electric Power Co., and in future they would only have an indirect interest in the working of that company through their holding in it. He referred last year to the labour question. They had again this year to meet further demands for increases in wages and salaries, and as far as they were justified he hoped they had met them in a generous spirit. They were not in any exceptional position in that matter. The demand for increased wages existed among the whole working population of the country. The expenses of living had increased and employers of labour during times of prosperity recognised, he thought, all fair demands willingly. That was right, but the cost to the company was not light and would give rise to considerable anxiety when the tide of prosperity turned. The question of economy was therefore always before the directors. Turning to the investments, the interest received on investments in the associated companies amounted to £30,849 compared with £30,180 in the preceding year, an increase of £359. The South Staffordshire Tramways (Lessee) Co. again failed to pay a dividend on its preference shares, but placed £3,500 more to reserve. They received an increased dividend on the ordinary shares in the Dudley Co.—4 per cent. against 2 per cent.—and they received an increased amount in dividend on the preference shares in the Investment Co., the dividend being for twelve months instead of for seven months as in the previous year. On the increase of their holding of debenture stock in the South Staffordshire Tramway (Lessee) Co., on which they received only six months' interest in the previous year, they had received a full year's interest this year, so that in spite of the fact that the equivalent of the dividend received in past years from their holding in the old City of Birmingham Tramways Co., Ltd. had not been received this year from the holding now representing that investment, there was room for congratulation that the dividend received from the associated companies still showed an improvement. He mentioned last year that they had every reason to hope for a substantial dividend from their holding in the Investment Co. for the year ending December 31st, 1913. That hope had not been realised, but he thought a reference to the report and accounts of that company would convince them that their investment was a good one, and that the conservative policy of the directors was entirely in their interests in the present financial conditions prevailing. Turning to the capital account, they would remember that there was an item of £212,091, a loan from the Shropshire and Worcestershire Co. That had been entirely liquidated during the year, and while the capital account had been increased on account of the tramway undertaking by £180,000, chiefly in the purchase of motor omnibuses, and on the lighting side by £6,523, it had been credited with £172,895, the result of the sale of the electric light undertaking of the Shropshire Power Co. Advances had been made to the Power Co. since the close of the year pending the completion of arrangements for the issue of the further capital on its own behalf to provide for the purchase of the electrical supply undertaking in Dudley and for additional plant now in course of delivery at the Smethwick power station. When the Bill now before Parliament to authorise the Shropshire Co. to issue preference shares had received the Royal assent, the company would become one of the biggest supply companies in the country. The area in which the Shropshire Power Co. operated was capable of large future development, and it would be necessary from time to time during the next few years to incur considerable expenditure for that purpose. During the year the Corporation of Birmingham decided that they must have all the means of transport inside the city in their own hands, and an agreement had been concluded with the Corporation by which they bought the garage of the omnibus company and 30 of the omnibuses of the Birmingham and Midland Motor Omnibus Co. He was glad to say that their relations with the Corporation continued to be very friendly, and as a result the agreement provided that the company's omnibuses, which would in future operate in the outside districts around Birmingham, might nevertheless run through into the centre of the city, but without plying for hire in the city and at a minimum fare. That was a satisfactory arrangement for the company, having regard to the fact that they had no longer any interests inside Birmingham. The outside business showed signs of expansion and good increases in receipts had taken place. The omnibus company had on order 40 additional 'buses to replace those sold to the Corporation. With regard to the reports of the associated companies, he could only add that the conservative policy of the directors of the Electrical and Industrial Investment Co. was fully appreciated by that board, having regard to the troublesome financial times through which they had been passing and the end of which was not even yet in sight. The result of the division of the ordinary shares of that company into half preferred ordinary and half deferred ordinary secured at least the equivalent of a 3 per cent. dividend in future on their original holding of £161,566 ordinary shares. The report of the Dudley and Stourbridge Co. showed a marked improvement on that of previous years. The South Staffordshire Tramways (Lessee) Co. appeared to have definitely turned the corner and to have put its bad days behind. The Wolverhampton and District Co. had also had a prosperous year and was able to increase its reserve fund and to pay the same dividend as in 1912. The Birmingham & Midland Motor Omnibus Co.'s receipts had increased by over £20,000, and that company was also able to show a fairly satisfactory result. To summarise the position, the total receipts showed an expansion of £10,718, while the expenses had increased by £8,568, giving a net improvement of £2,150, whilst the surplus at their disposal amounted to £58,258 against £55,108. As a result of the transactions of the year they had £63,000 in reserve funds, in addition to which the subsidiary companies had their own seperate reserve and renewal funds, the total amount of which on 31st December last was £87,829. They were therefore able to maintain the dividend on the ordinary shares at 3½ per cent., to place £4,000 to renewals fund, compared with £5,000, and to place to reserve £2,000 against £3,000.

Mr. J. A. Lycett seconded the motion, which was adopted without discussion.

Singapore Electric Tramways, Ltd.

Sir Frank. A. Swettenham (chairman) presided on Tuesday at 19, St. Swithins Lane, E.C., over the annual meeting.

The Chairman, in moving the adoption of the report, said the capital now stood at £100,000, effect having been given in the accounts to the reduction of the shares from £1 to 5s., which was sanctioned by the court in February of last year. To meet these new conditions £3,825, the debit balance of the profit and loss account at December 31st, 1912, had to be written off, and the amount at which the tramway undertaking stood in the books of the company had been reduced by £296,175. Last year he referred to the progressive state of the company's business, and the year 1913 showed a marked improvement over 1912, the profit being £9,385, and they now for the first time had a balance on the right side. They had given earnest consideration to the question as to the commencement of the payment of a dividend. The board were as anxious as the shareholders that the time should be as early as possible, but they considered it prudent this year to recommend that the balance of profit should be carried forward, although they did not think it would be too optimistic to say that by next year they would be in a position to recommend the payment of a dividend which they hoped would be the forerunner of an annual distribution of profits. A strong reason for deferring the question of a dividend was that the board for long had under consideration the recommendation of their manager to construct a parallel line of tramways in the most densely inhabited part of Singapore, and that would cost a large sum. The project had much to recommend it, but depended at present on certain questions in regard to two bridges which had to be widened, and the apportionment of the cost of this work was still the cause of correspondence with the Singapore Municipality. As time went on extensive repairs were needed, and for all these reasons the board considered that it was well to strengthen the financial position of the company and carry forward the profits of 1913. They had already shipped several items of the new power plant, and they hoped to get the 350 kw. Diesel engines shipped in the course of a week or two. This new plant would cost about £16,000 f.o.b., so that with the freight and erection the total capital expenditure would be in the neighbourhood of £20,000. The revenue showed an increase as compared with the previous year of £9,360, or approximately 15 per cent. The gross receipts from the sale of current for lighting and power were almost 10 per cent. down as compared with 1912, but this decrease was wholly accounted for by the revised scale of rates charged to the Municipal Commissioners of Singapore, which came into force on January 1st, 1913. Year after year, the revenue from this source had shown a high percentage of increase and had become an important part of their business, and clearly therefore it was their duty to go into the matter very closely and to offer the best terms they could to the Municipal Commissioners in order to secure a continuance of trading with them. They were confident that the demands would increase and fully justify the course they had taken. As was pointed out in March last year, the supply contract was to be extended for a period of 10 years from the date that electrical current was supplied to the Tanglin district. They were not yet able to say when the first supply for this district would be required, but until it was they had the satisfaction of knowing that they had the minimum of 10 years' trading with the municipality before them. The expenditure for the year had increased somewhat in one or two branches, particularly in fuel, which was nearly £1,200 in excess of 1912. This was attributable almost wholly to the increase of 373,000 units of energy, and coal also had been slightly dearer. The traffic expenses showed an increase of about £600, or about 4½ per cent. more than the previous year. Maintenance and repairs were £2,600 higher, the principal item being an increase of £2,000 in the work on the permanent way. This was an expenditure which could not be avoided, and which must not be neglected. In Singapore a great deal of their track was very little above sea level, the road being constructed on what was practically a mud subsoil, and it was therefore very necessary that any defects in the per-

manent way through sinkage or other cause should be promptly repaired. The expenditure on the track, however, meant an avoidance of what might become a heavy expense for rolling stock maintenance. They had written off to depreciation on track, rolling stock, etc., £13,269. It was shown by the statement of averages published with the accounts that they carried over 16 million passengers during last year, or an increase of nearly 2,200,000, and it was very satisfactory to note that they were more than maintaining this year the volume of traffic. The receipts for the current year to Saturday last were 9,671 dollars in excess of the corresponding period of last year. Notwithstanding the increased traffic, the car mileage was reduced by 34,677 miles as compared with a reduction for the previous year of 29,698 miles. The passengers carried per car mile had gone up from 6.71 to 7.9. The receipts per car mile for last year were 8.69d., as against 7.44d. in 1912. The expenses per car mile were 4.42d., or an increase of 0.3d. per mile. The expenses of the tramway undertaking represented 50.9 per cent. of the receipts, while the total Singapore expenses were only 49.53 per cent. of the total Singapore revenue. In 1912 these figures were 57.25 per cent. and 52.66 per cent. respectively. In conclusion the chairman said the board had great pleasure in expressing their satisfaction at the manner in which the work of the company had been conducted in Singapore by their manager and his staff.

Mr. E. DAVIS seconded the motion.

Mr. SHAW contended that the board were using the profits of the company to purchase debentures, and that seeing how long the shareholders had been without a dividend they ought to have one.

Mr. WALDRON asked from whom the debentures were bought, and if the company had purchased any from members of the board or from companies with which members of the board were associated.

The CHAIRMAN said the board had only one interest—it was that of the shareholders—and seeing that the debentures were bought at a considerable discount and they were saving interest, he thought it was a good way of using their money.

Mr. E. DAVIS (a director) said the debentures had been purchased slightly below the market rate. In one case they bought a number from a company with which some of them were connected. The new construction they had in view would cost £45,000, and they would be able to borrow money for the purpose on the security of the debentures they had in hand.

The CHAIRMAN said they anticipated that the work they contemplated would pay them well. He had said they hoped next year to pay a dividend, and personally he would be greatly against the payment of a dividend unless they saw their way to continuing it.

The motion was carried and the retiring directors re-elected.

Bombay Electric Supply and Tramways Co., Ltd.

THE directors report that for the year ended 31st December, 1913, the total revenue from all sources, including the amount represented by sale of current to the tramways, amounted to £276,468, an increase of £19,768, or 7.70 per cent. over the previous year. The total expenditure was £130,896, an increase of £2,878, or 2.24 per cent. The net profit aggregated £145,573, showing an increase of £16,891, or 13.12 per cent. After deducting interest on the debenture debt amounting to £36,132, placing £23,500 to depreciation account, £6,668 to sinking fund, and deducting £8,000 for the redemption of the second debentures of equivalent par value drawn for repayment on the 1st July last, there remains £71,273 plus £5,072 brought forward.

The directors recommend payment of the dividend on the 6 per cent. cumulative preference shares £22,497, and that accrued to 31st December, 1913, £13,498; a dividend on the ordinary shares at the rate of 6 per cent. per annum, free from English income tax, £36,000, leaving £4,350 to be carried forward.

The gross receipts from the tramways amounted to £170,672, compared with £163,662. The working expenses were £81,123, against £78,842. The balance of receipts over expenses in respect of the year's working is £89,549, compared with £84,820 for the previous year.

The progressive expansion of the company's traffic reflects the building activity in many districts of the city, and the recent opening of the new and extensive Alexandra Docks is evidence of the always increasing trade of the port. In addition to the extensive programme of the Bombay Improvement Trust, a special committee appointed by Government has recently sat to consider and report on further measures for the development of the city, with special reference to the question of greater facilities for urban transportation. It is anticipated that further extensions of the tramway system will be advocated and facilitated. To meet the present demands of the traffic ten more two-car trains are to be added to the rolling stock. Three of these are already in service, and the remaining seven are now under construction in the company's workshops.

	Year ended 31st Dec., 1912.	Year ended 31st Dec., 1913.
Miles opened—		
Route miles	20.38	20.38
Passengers carried	38,612,891	40,692,022
Proportion of expenses to receipts	49 p.c.	48 p.c.
Cars in stock—		
(A) Running singly	150	150
(B) Coupled as two-car trains	60	60

The gross revenue from electric supply for the year, including the amount represented by the sale of current to the tramways, aggregated £105,466 compared with £91,414 for the preceding year. The working expenses were £46,284 against £45,683. The receipts, exclusive of the revenue represented by the current supplied for the tramways, amounted to £77,569 compared with £61,463 for 1912. The balance of £59,182 compares with £45,731 for 1912.

Year ended.	Consumers.	Equiv. 80-watt lamps.	Units sold. Lighting and power.	Units sold. Tramways.	Total.	Revenue. £	Expenses. £	Balance. £
1911	2,091	241,897	3,356,184	4,581,614	7,937,798	76,530	48,264	28,266
1912	3,112	300,200	4,364,977	4,792,167	9,157,144	91,413	45,683	45,730
1913	4,468	386,591	5,792,308	5,150,302	10,942,610	105,466	46,284	59,182

The progress of the supply branch continues satisfactory. All the extensions made to the company's mains last year are producing profitable results, and further extensions are being laid this year. The generating costs at the Kussara power house have again recorded a satisfactory declension. The new 2,000 KW. turbine set was brought into service in April of this year, and promises to prove the most economical generator yet installed. Several important contracts for the supply of power are under negotiation. At the request of the Municipal Corporation the company has arranged to make a demonstration of the most up-to-date methods of electric street lighting in certain streets of the city.

The capital expenditure during the year has aggregated £58,315, and has been applied to the extension of the company's mains, the consequent provision of additional sub-stations, the completion of the equipment of the Kussara power house, and the provision of additional rolling-stock as above-mentioned.

United Electric Tramways of Montevideo, Ltd.

IN their report for the year ended 31st March, 1914, the directors state that the results of the operation of the tramway system for the year to 31st October, 1913 (the fiscal year of the Uruguayan Co.), are shown as under:—

	1912-13.	Increase.
Gross receipts	$1,755,572	$127,936
Operating expenses	1,045,941	111,089
Net receipts	$709,631	$16,847
At Exchange of $4.7 to the £	£150,985	£3,584
Passengers carried	44,622,690	3,886,488
Car miles run	7,461,194	382,019
Percentage of operating exp. to gross receipts ...	59.58	2.14

Traffics were affected by the interruption of many of the company's important services owing to the repaving works which were in progress during practically the whole year. The paving of important streets in the city is still proceeding, and it is expected this work will continue during the greater portion of the current year, when the paving contracts entered into by the Municipality of Montevideo should be completed. The increase in the ratio of working expenses is chiefly due to the fact that the gross receipts have not risen proportionately to the increase in wages and cost of general repairs and renewals. The construction of the two sub-stations has been practically completed, and the erection of the plant is being proceeded with. It is expected that these sub-stations will be ready for operation in time for the heavy traffic during the next summer season. The new car-shed, and also the extension to the existing central car-shed, have been completed and are now in service. These extensions necessitated the provision of further capital, and £84,502 debenture stock, 10,000 preference shares and 19,800 ordinary shares were issued. The amount received from La Sociedad Comercial de Montevideo in respect of dividend and interest was £147,214. The profit and loss account for the year, after providing for administration expenses, and charging £46,930 for debenture interest, shows a credit balance of £91,282 plus £14,020 brought forward, making a total to be dealt with of £105,302. The following amounts have been set aside:—For redemption of debenture stock, £3,161; for redemption of the preference and ordinary share capital, £2,500; for renewals and contingencies, £30,000. After paying the preference dividend of 6 per cent. and an ordinary dividend of 7 per cent. for the year, there remains to be carried forward £12,641.

Reference is made to the death of Mr. Frame Thomson, who had been a director of the company from the commencement, and had rendered it valuable service. Mr. George Balfour, who has a wide knowledge of tramway engineering and administration, was elected a director of the company on 31st October, 1913.

In view of the overspent position of its capital account, and of the further capital expenditure which it will be necessary for the company to undertake in course of the next three years upon the creation of additional revenue-earning assets in the shape of extensions to its mains, anticipated extensions to the tramway lines, and the provision of the new Kingsway depot and workshops, the necessity of increasing the company's capital will shortly arise. The directors are giving the question of the form which this issue should take their careful consideration and their conclusions regarding it, should a further issue of shares seem advisable, will in due course be submitted for approval. £3,843 of the company's 4½ per cent. debenture stock was purchased and cancelled last year for the purpose of the sinking fund, reducing the amount outstanding on 31st December to £583,730. Mr. A. T. Cooper on resigning his position as managing engineer of the company at Bombay, has been elected a director.

New General Traction Co., Ltd.

BARON EMILE B. D'ERLANGER presided on Monday at 8, Crosby Square, E.C., over the annual meeting.

In moving the adoption of the report (ELEC. REV., p. 957), the CHAIRMAN said that it was impossible to make a comparison between the accounts of this year and last, because in view of the reconstruction of the company last year, the accounts were for a broken period. This was the first year, taken as a whole, under which the company had operated since the capital was reduced, and there had only been one class of shares. The report was so simple and clear that he would only be wasting their time to repeat the figures one by one. He wanted to draw their attention to the fact that the company was now simply a trust company holding certain securities in various enterprises, such as the Darby, Media and Chester Street Railway Co., and Norwich Tramways Co., and the Douglas Southern Electric Tramways. From their American enterprise they derived a fixed income on the bonds, and 5 per cent. guaranteed interest on the shares. From the Norwich Co. they received a dividend which naturally fluctuated with the results attained in the year. From the tramways company last year they received 3 per cent. He was glad to say this company seemed now to have passed over what might be called the children's diseases stage, and had attained a stable earning capacity, and he trusted they would find improved results as time went on. They held a large interest in the Douglas Electric Tramways as compared with the total capital of that company, and that also showed a fluctuation according to the seasons because it was a holiday traffic, and they had to reckon on the weather which prevailed during the summer holidays as to whether their receipts were better or worse. They had a very good income last year, and they trusted they would get an equally good one this year. He thought they might say, so far as the New General Traction Co. was concerned, it was established on an absolute sound and permanent basis, and that they might look forward to a somewhat increased receipt from some of their subsidiary companies, and, therefore, somewhat increased dividend themselves in the future. He thought they could look upon a dividend of 4 per cent. as permanently established. The Norwich Tramways were an improving company, and in accord with the Municipality of Norwich the company had applied for certain powers for extensions which would involve a capital outlay of some £30,000. The Bill had passed the House of Commons, and was now before the House of Lords. He had had the privilege of being connected with the company for a great many years, and had acted as its chairman since the death of Captain Paley. He took the finances of the company in hand at a time when it was faced with a great many difficulties, and, thanks to the insistent labours of Mr. Hopkins and the patience and ability of his colleagues, the company had attained a position which he considered as permanent, and from which he considered possible risks of any retrogression were effaced. It was possible he might not have the honour of presiding over any meeting in the future, for, as was well known in the City, his occupations were very numerous, and his time limited, and if he did not leave companies which were absolutely on an assured footing, he would never be able to curtail his responsibilities at all. Therefore it was very probable that before the end of the year he should ask his colleagues to be good enough to relieve him of the work which the company entailed. If he did leave, it would be with extreme regret, for one could not sever one's association with the company one had been connected with for over 18 years without a wrench.

The HON. A. G. BRAND seconded the motion, and said the shareholders would regret to hear of the chairman's possible retirement. In the past, whenever they had had difficulties with regard to finance, the chairman had been their bulwark and had pulled them through in a manner which had been to the credit of himself and the company.

The motion was carried.

MR. PARKER, in proposing a vote of thanks to the board, hoped the chairman would still retain his position in the company, as now it was in an assured position the work could not be difficult. He also expressed the hope that the company would be able to declare an interim dividend.

The CHAIRMAN, in reply, said he thought they would soon reach a time when an interim dividend could be paid.

British Electric Traction Co., Ltd.

THE directors' report for the year ended March 31st, 1914, states that the Associated Companies have in the past year continued to make satisfactory progress in regard to tramway traffic, the sale of electricity for light and power purposes, motor-omnibus services, and in other respects. The receipts have been favourably affected by the continuance of trade prosperity and by the more seasonable weather during the summer of 1913. The total traffic receipts on the services which were in operation both last year and the preceding year, show an increase of £145,744. The receipts from the supply of electricity amounted to £428,518, and show an increase of £75,516, as compared with 1912. Working expenses, however, increased owing to a general rise in wages and the increased cost of materials. The Northern Ontario Light and Power Co. continues to show improved results. Progress has been made with the construction of the lighting and tramway system at Pelotas by the Rio Grandense Light and Power Syndicate, and also with the development of the Maritime Coal, Railway and Power Co.'s business. The company has acquired an interest in the Oesterreichische Motor-Omnibus Gesellschaft, which is working motor-omnibuses in Vienna.

The gross profit of the company for the year amounts to £225,754, as compared with £210,880 for 1912-13. After deducting management expenses and other charges, including the expenditure during the year on negotiations in regard to new business, there remains a balance of £204,973 plus £12,493 brought forward. After deducting debenture stock interest amounting to £91,384, there remains a balance of £126,083. The revenue account has been debited with £6,486, being the amount reserved against or written off various assets, and the directors have, in addition, placed £50,000 to reserve for depreciation, and they recommend the payment of the dividend for the year upon the 6 per cent. cumulative preference stock, and a dividend of 3½ per cent. upon the 7 per cent. non-cumulative preference stock, together amounting to £52,467, carrying forward £17,130. During the year the directors purchased in the market, and cancelled, £1,000 5 per cent. perpetual debenture stock, and £2,600 4½ per cent. second debenture stock of the company. The outstanding debenture stocks have been reduced by these amounts, and the difference of £784 between the nominal value and the purchase price has been added to reserve. The item investments and undertakings, after deducting the reserve for depreciation, stands at £4,672,458, and consists of shares and debentures in associated tramway, electricity supply, manufacturing and other companies, Government, municipal and sundry securities, and undertakings. The revenue from the investments and undertakings amounted to £209,045, as compared with £193,305 in the previous year. The yield for the past year on £4,672,458 was 4·47 per cent., as compared with 4·11 per cent. for the preceding year on £4,696,052.

The reserve against depreciation of investments has been increased by £19,686 profit on sale of sundry investments, by £784 in respect of debenture stocks purchased and cancelled; and also by £50,000 transferred out of the profits of the past year. The reserve has been debited with £20,005, being the deficiency in book value on realisation of the Cavehill and Brighton undertakings, and the loss on sale of other investments. The balance at credit of this account is now £602,923, which amount is shown in the balance-sheet as a deduction from the amount at which the investments and undertakings stand in the books. There are additional reserves against specific assets of £69,102, and a balance carried forward amounting to £17,130. The amount of profit placed to reserve or unappropriated by the associated companies in respect of the year 1913 was £314,860. The corresponding figure for the previous year was £275,883. "As the stockholders are aware, the board has for some time had under consideration the question of dealing with the depreciation in the value of the company's assets, and a memorandum with regard to proposals for reduction of capital is in course of preparation for issue to the stockholders."

The annual meeting will be held at the Holborn Restaurant on June 18th.

French and Belgian Companies.

THE *Compagnie Française Thomson-Houston* reports gross profits of £261,000 on manufacturing in 1913 as compared with £216,000 in the preceding year, and including the yield from investments the total profits amount to £328,000 as against £295,000 in 1912. After meeting interest charges on loans and defraying other items, the net profits are returned at £173,000 as contrasted with £172,000 in the previous year. It is proposed to pay a dividend of £1 8s. per share on the ordinary capital of £2,400,000, being the same as in 1912.

The report of the *Société Anonyme Westinghouse, of Paris*, records an increase in the value of the turnover in 1913, and states that the department at Freinville worked favourably, whilst that at Havre improved. The gross surplus amounts to £67,000, of which £8,000 has been devoted to the extinction of the deficit brought forward from 1912, £40,000 has been applied to depreciation, and the balance is absorbed by an allocation to the reserve fund and the amount carried forward. It is, therefore, not possible for the company, which was reorganised in 1911, to pay any dividend. The report mentions that the Italian Westinghouse Co. had received an order for electric locomotives of the value of £600,000, and that as further capital was needed, the three principal shareholders in the Italian company had advanced £112,000 to that company.

The *Société Générale Belge d'Entreprises Electriques, of Brussels*, which is an investment company, reports gross profits amounting to £110,000 for 1913 as compared with £88,000 in the previous year. The deduction of interest on loans, general expenses and depreciation leaves net profits of £79,000 as against £62,000 in 1912. It is proposed to distribute £2 2s. per share (10½ per cent.) on the ordinary shares as contrasted with £2 in 1912, and 13s. 9d. per share on the founder shares as against 10s. 5d. per share in the preceding year, the ordinary share capital which participates being £600,000 as compared with £500,000 in 1912.

The *A.E.G.-Union Electrique*, reporting on the year 1913, states that business was abundant in the first half of the period, if the term of the general strike was left out of consideration, but in the second half the financial and critical situation caused the colliery owners and iron and steel works to reduce their purchases to a minimum. Nevertheless, the company was able to obtain satisfactory results owing to the diversity and extent of its sphere of activity. The city of Liége took over the local electricity supply system last July, when the company secured an important order for extensions of the station. After allocating £3,000 to depreciation, the accounts exhibit net profits of £15,800, or approximately the same as in 1912, and the directors recommend the payment of a dividend of 18s. 7d. per share on the ordinary shares and 9s. per share on the founder shares.

German Electrical Companies.

THE *Elektrotechnische Fabrik Rheydt, Max Schorch & Co., of Rheydt*, report that the company was well employed in 1913, particularly for the textile industry, and a large portion of the production was exported. The gross profits amounted to £17,000, as against £14,000, and after providing for depreciation, the net profits permit of the distribution of 8 per cent., as in the previous year.

The *Elektrizitäts Lieferungs Gesellschaft, of Berlin*, which owns 21 supply stations and works several others under agreements, reports an increase in the connections from 35,758 KW. in 1912 to 42,176 KW. last year. As gross profits, the accounts show the sum of £310,000, as compared with £274,000 in 1912, and the net profits were £213,000, as against £184,000. The directors recommend a dividend of 12 per cent. on the ordinary share capital of £1,500,000, being the same rate as in 1912.

The *Deutsche Kabelwerke, A.G., of Berlin* report gross profits, of £89,000 for 1913, as contrasted with £75,000 in the previous year. After defraying general expenses, taxes and interest charges, and apportioning £12,700 to depreciation, as against £12,100 in 1912, the accounts exhibit net profits of £34,000, as compared with £31,000, the dividend being 8 per cent., as in the preceding 12 months. The turnover largely increased last year, and this was also the case with the Union Cable Co. The activity of the Kabelwerke in the present year has hitherto been satisfactory.

The directors of the *Sachsenwerk, Licht und Kraft A.G., of Dresden*, which took over the former Kummer works a few years ago, report that a considerable increase in the volume of business occurred in 1913. The company acquired the Medlitz overland station, and also an interest in the Dresden Light and Power Supply Co. After placing £10,000 to depreciation, as compared with £8,700 in 1912, the accounts indicate net profits of £45,000, as contrasted with £30,000 in the preceding year. It is intended to distribute 7 per cent. on share capital of £212,500, this rate comparing with 6 per cent. in 1912.

The *Land und Seekabel Werke, of Cologne-Nippes*, experienced a favourable development in 1913, during which all departments were fully employed. The accounts show, after apportioning £15,000 to depreciation as in 1912, net profits of £38,000, as against £35,000, and a dividend of 11 per cent. has been declared, this contrasting with 10 per cent. in 1912 on a share capital of £262,500. Since the opening of the present year the orders received have been satisfactory, although they are slightly less than in the early part of 1913.

The *Gesellschaft fur Elektrische Unternehmungen, of Berlin*, which is financially interested in many supply works and tramways, states that the rate of progress in the supply of energy in 1913 slackened as compared with preceding years in consequence of certain industries being prejudicially affected by the general decline in trade. After providing for interest payments on the loans amounting to £2,049,000, the accounts show net profits of £318,000 for 1913, as contrasted with £279,000 in 1912. A dividend of 10 per cent. is proposed on the share capital of £2,500,000, and 5 per cent. on £500,000, as against 10 per cent. on the former sum in 1912.

The *Akkumulatoren Fabrik, of Berlin and Hagen*, which completed orders for £1,102,000 in 1913, as against £1,016,000 in 1912, states that the total results were prejudiced by the high prices for lead and the increased cost of other materials, salaries, &c., but larger receipts were derived from investments. During the year the company acquired the shares in the German Edison Accumulator Co., and assumed a greater interest in the Hungarian and Russian Tudor Accumulator Companies. The net profits realised in 1913 amounted to £147,000, as contrasted with £125,000 in the previous year, and the directors recommended a dividend of 20 per cent. on share capital of £600,000, this comparing with 25 per cent. in 1912.

The report for 1913 of the *Bergmann Elektrizitäts Werke, of Berlin*, states that the volume of the turnover increased by 10 per cent. as contrasted with the previous year. The machinery department yielded satisfactory results, and the sales were considerably greater in the departments for apparatus, transformers, small and medium sized machines and electric tools. During the present year the company would begin the delivery of the electric locomotives ordered by the Prussian State Railways, and the company is also interested in the introduction of electric traction on the Berlin City and Circle railways. After setting aside £179,000 for depreciation, as compared with £193,000 in 1912, the accounts indicate net profits of £158,000, as against £119,000. It is proposed to pay a dividend of 5 per cent. on capital of £2,387,000, this contrasting with a similar rate on less capital in 1912 and 2½ per cent. on new capital.

The report of *Voigt & Haeffner A.G., of Frankfort-on-Main*, states that notwithstanding the unpropitiousness of circumstances in 1913 it was possible for the company to secure an increase in the turnover, especially in export markets. The gross profits amounted to £164,000 as compared with £141,000 in 1912, and after meeting general expenses the sum of £13,000 has been set aside for ordinary depreciation as against £14,000. Including the balance forward the net profits total £104,000 as contrasted with £76,000, and after allocating £33,000 to extra depreciation as against £25,000 the balance permits of the payment of a dividend of 12 per cent. on ordinary capital of £250,000, this comparing with 10 per cent. in the previous year. At the recent general meeting it was stated that the period of general declining prosperity had not manifested itself to a great extent as the sales in the first three months of the new financial year were higher than in the corresponding term of 1913. Nevertheless, a slower course of business caused prices to fall and a depression in prices was perceptible in all departments.

Torpoint Electric Light Co.—At a meeting held on Saturday it was reported that the required capital had been subscribed, and it was decided to proceed to allotment forthwith. A survey of the streets and the site was made, and the engineer (Mr. Purves) was instructed to place the orders for the plant, &c., tenders for which had been obtained. The site secured for the generating station is at Thanckes, where existing buildings will be converted for the purpose. Torpoint Urban Council has adjourned the question of public lighting to a special meeting.

Stock Exchange Notices.—A special settling day has been appointed as follows:—

Thursday, June 18th.—Toronto Power Co., Ltd.—Prov. scrip fully paid for £523,655 4½ per cent. cons. gua. deb. stock.

And the following have been placed on the Official List:—

Calgary Power Co., Ltd.—Further issue of £146,700 5 per cent. 30-year first mortgage bonds of £100 each.

Calgary Power Co., Ltd.—Further issue of £9,700 5 per cent. 30-year first mortgage bonds of £100 each.

Continental.—FRANCE.—Among the new electrical companies recently formed in France, are the Société d'Electricité du Nord-Est Parisien, Paris (4, Rue Michel Ange), capital £40,000; La Société d'Electricité de Thorens, organised with a capital of £8,000 to establish a small central electric lighting station in the little town of Thorens (Upper Savoy); and La Compagnie des Tramways Electriques du Libournais, Bordeaux, capital £24,000.

SPAIN.—La Société Franco-Espagnole de l'Electricité is the name of a new company which has just been formed in Paris, with a capital of £500,000, the principal object of the concern being to provide the new capital required for the extension of the Barcelona Light and Power Co.

Havana Electric Railway, Light and Power Co.—The report states that the combined accounts for the year 1913 show as follows:—Gross earnings, $5,417,054; operating expenses (45·96 per cent.), $2,489,831; net earnings from operation (54·04 per cent.), $2,927,222; interest on deposits, rents, &c., $140,087, making together $3,067,309. Deducting fixed charges, taxes, &c., $1,219,206, there remains a surplus income for the year of $1,848,103, plus $856,809 (being excess in dividends received on stock of the Havana Electric Railway Co. during the year from its accrued surplus over its actual earnings for 1913), and surplus January 1st, 1913, $294,749; total, $2,999,662. This was disposed of as follows:—Dividends paid during the year, $1,686,204; profits transferred to sinking fund reserve, $92,412; profit and loss balance carried forward, $1,221,045. Steps for equipping and organising a new business department have been taken, and an appropriate site for a display room of gas and electrical appliances has been secured at the corner of Prado and San Miguel Streets. The work on the consolidated power plant is being satisfactorily carried on, and when completed, about August, 1914, will enable the abandonment as generating stations of the three steam plants now in operation. This plant will be comparable in capacity and completeness of equipment and organisation with the very large power stations of the world.—*Financier*.

Morocco.—La Société Marocaine de Distribution d'Eau, de Gaz, at d'Electricité is the name of a new company which has lately been formed in Paris (15, Rue Pasquier) with a capital of £80,000.

STOCKS AND SHARES.

Tuesday Evening.

By this time the shock to City circles caused by the suspensions of Messrs. Chaplin, Milne, Grenfell & Co., and of the Canadian Agency, Ltd., has lost the first keenness of its edge. On Saturday morning, when the Chaplin, Milne announcement was made, there was for a time renewed flatness, following upon profound depression in the two or three days previous. It is often the case in the Stock Exchange, however, that any announcement has an effect directly opposite from what might be expected—to explain which would require more space than is available in mere notes on the electrical markets.

The failures, it must suffice to say, were taken in the Stock Exchange as clearing the air to some extent. Bears had been busy pressing down prices, but as soon as bargain-hunters began to appear, the shorts allied themselves to the buyers, and sharp recoveries ensued. One of the best illustrations this week is District Ordinary, the price of which had bent to 20½ last Saturday, from which it sprang to 24 upon the pressure being relaxed, so that on the week the quotation is actually 1 higher. Tuesday's carry-over in the markets evidenced abundance of money for this purpose, and Consols led swift recoveries in most departments.

The Chaplin, Milne suspension scarcely influenced any of the markets with which these notes are concerned. The latter are naturally coloured by whatever sentiment happens to be uppermost in the Stock Exchange at the time, but with so many investment securities in our lists, the changes are bound to be comparatively slight, save in times of high excitement in either direction; and, in spite of all its troubles, the Stock Exchange has not been demoralised throughout its long period of gloom and melancholy.

When prices go a-soaring, men shut their eyes—and wilfully—to the probability of those prices ever coming down again. When

everything is flat, financial opthalmania prevents public apprehension of the fact that matters will mend by-and-by. So in the one case people miss the chances of taking profits, while in the other they are tempted to wait too long, missing opportunities in this way which are presented to them for the acquisition of really cheap stock.

It is incontrovertible that the swing of the pendulum will drive up prices from their present levels, though as to the precise date of such happy happening no reasonable pen would care to make more than a guess. All that we know is, that at the present time, many stocks are very cheap; and while they may go cheaper still, the day will come, as sure as ever slump followed boom, that this depression will give place to prices of a substantially high nature. Merely to write in this vein, however, is to attract the taunt of breezy optimism that is always levelled when a note of cheerfulness is struck amidst prevailing despondency. All of which, maybe, the reader will deride as superfluous platitude, leaning to the safe side.

To proceed to particular markets, therefore, the most interesting point has already been mentioned—namely, the violence of the fluctuations in Districts. So narrow is the market in the stock that each seller of a small amount depressed the price inordinately. A financial paper took up the cudgels on behalf of the stock, and started the recovery, which, as already noticed, fully wiped out the earlier slump. Metropolitans went back to 38¼, and, recovering to 39½, show a loss of only ⅜; the Surplus Lands stock, however, has fallen back 2 points to 60. Underground Electric Railways shares reacted after their previous rise, and the Income bonds went back to 89, though the losses have been since regained. The Board of Trade returns, showing clearly enough that the trade of the country is beginning to recede from its high-water mark, are not regarded in the Stock Exchange as an unmixed evil. One of the principal reasons why stocks and shares have gone down to such an extent of recent years is the fact that booming trade has absorbed so much capital that the effect has been to keep money dear, and to retain in trade circles large amounts of capital which would otherwise have been available for investment purposes. If less money is to be required in business circles, through falling off in trade, capital will gradually seek the Stock Exchange for profitable employment, and therefore the House is disposed to look indulgently upon decreases in exports and imports.

The British Electric Traction report is a somewhat colourless document, and has produced no price-changes in the company's securities. The most significant paragraph of the report is that in which it is declared that the board has for some time had under consideration the question of dealing with the depreciation in the value of the company's assets. A memorandum with regard to the proposals for the reduction of capital is stated to be in course of preparation for issue to stockholders, and this is accepted as a hint of the directors' determination to re-arrange the capital of the company on lines less clumsy than those at present laid down.

The Latin-Canadian group remains beneath the cross-currents that flow from Mexico and Brazil. Rumour has full scope for imagination and romance in the sittings of the Conference at Niagara. One day, peace is close at hand; on the next, the dove with the olive branch has timidly retreated. Prices are jerked up and down on these reports, and stockholders must have come to take little notice of the rapid fluctuations in the prices of their securities.

Mexico Tramways went back to 68, but rallied to 71, and the company's bonds of both classes are better. Mexican Light and Powers are virtually unaltered. Brazilian Tractions went ahead on the issue of a report that was generally considered satisfactory; at one time the price dipped to 78, but since then it has recovered to 81. The improvement in the Brazilian rate of exchange is another consideration which has helped the price of Brazilian Tractions materially, but still the quotation shows a small fall on the week. Rio Tramways bonds and Sao Paulos are all better. The Anglo-Argentine Tramways group has also hardened, and City of Buenos Ayres Trams Debenture went up again. In the Canadian group there are improvements in Canadian General Preference, Cochabamba bonds and Montreal Common shares, the only decline in this division being one of a point in Shawinigan Water. Of the Indian shares, Calcutta Supply Ordinary lost ½; the rest remain steady.

Electricity Supply shares are a trifle irregular. Values, on the whole, are well maintained, and the market has been little troubled by sales on behalf of those compelled to realise investments in order to clear other commitments. City Lights rose ¼, but Kensingtons are ⅛ easier, and so are London Electric Ordinary. Hove shares keep steady at 8¼, the idea being current that the Hove Corporation will before long acquire the undertaking.

Some link the recent strength of Cromptons with that of Hove Electric shares, but Crompton Ordinary have gone back a little, and are quoted about 4s. The demand for Westinghouse Preference continues unabated, and the price has made another advance to 36s. 3d. middle, the 6 per cent. Prior Liens hardening to 102½. Were it not for this, the Manufacturing list would present an uninteresting aspect. Dick, Kerr Preference retain their rise; and, taking the market as a whole, the tone is certainly firm.

Marconis dropped to 2 1/16, and from the character of the selling it would appear as though some, at least, of it were forced. The bears took full advantage of the weakness, adding their sales to those of real holders. Monday's recovery, however, put a different complexion upon the market, and the price improved to 2 3/16, which left a loss of 5s. on the week, while the Preference were 1/16 lower. Canadians at 6s. 6d., and Americans at 13s. 6d. are a little less dull than they have been, which is about all that can be said for them. Rumour sports with the possibilities of the coming dividend announcement, expectation looking for the maintenance of the previous 20 per cent., which some regard as optimistic. New York Telephone bonds are better at 100¼. Telegraph stocks as a whole are inclined to sag, and there are small falls in Anglo-American Preferred and Eastern Telegraph Ordinary. West India and Panama continue weak, and proprietors have not yet recovered from their disappointment at the probability that the expected advantages that were to accrue from the opening of the Panama Canal may not visit the company until a later date than was anticipated.

Raw rubber this week has been down to 2s. 3d., but the Mincing Lane auction sales were so far satisfactory that they had the effect of putting up the price nearly a penny per lb. Dealings in the share market continue to be more or less desultory, prices weakening and firming within narrow margins, careless of the various conflicts that are raging round the question of what is, and what is not, synthetic rubber.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, June 10th

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a ,, Nitric	,,	22/-	..
a ,, Oxalic	per lb.	2¼d.	..
a ,, Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	,,	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29	..
a Bleaching powder	,,	£6 5	..
a Bisulphide of Carbon	,,	£18	..
a Borax	,,	£17 10	..
a Copper Sulphate	,,	£21	5s. dec.
a Lead, Nitrate	,,	£30 10	..
a ,, White Sugar	,,	£27 10	..
a ,, Peroxide	,,	£39	..
c Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	8¼d.	..
a Potash, Caustic (88/90 %) ..	per ton	£22 10	..
a ,, Chlorate	per lb.	8d.	..
a ,, Perchlorate	,,	8¾d.	..
a Potassium, Cyanide (98/100 %) .. (for mining purposes only)	,,	7½d.	..
a Shellac	per cwt.	70/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers ..	,,	£8 10	..
a ,, Recovered	,,	£5 10	..
a ,, Lump	,,	£5 5	..
a Soda, Caustic (white 70/72 %) ..	,,	£10	..
a ,, Chlorate	per lb.	3¾d.	..
a ,, Crystals	per ton	£3 5	..
a Sodium Bichromate, casks ..	per lb.	6d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots ..	per ton	£86	..
b ,, Wire, in ton lots (1 to 14 S.W.G.)	,,	£107 6 8	..
b ,, Sheet, in ton lots ..	,,	£112	..
p Babbitt's metal ingots	,,	£60 to £221	..
c Brass (rolled metal 2' to 12' basis)	per lb.	7d.	¼d. dec.
c ,, Tube (brazed)	,,	9⅜d.	..
c ,, ,, (solid drawn) ..	,,	7⅞d.	..
c ,, Wire, basis	,,	7¼d.	⅛d. dec.
c Copper Tubes (brazed)	,,	9⅜d.	..
c ,, ,, (solid drawn) ..	,,	9⅜d.	..
g ,, Bars (best selected) ..	per ton	£77	£1 dec.
g ,, Sheet	,,	£77	£1 dec.
g ,, Rod	,,	£77	£1 dec.
d ,, (Electrolytic) Bars ..	,,	£65 5	£1 dec.
d ,, ,, Sheets ..	,,	£88 15	10s. dec.
d ,, ,, Rods ..	,,	£71 5	10s. dec.
d ,, ,, H.C. Wire	per lb.	8⅝d.	⅛d. dec.
f Ebonite Rod	,,	4/6	..
f ,, Sheet	,,	4/-	..
n German Silver Wire	,,	1/10	..
h Gutta-percha, fine	,,	9/-	..
h India-rubber, Para fine	,,	2 9½	½d. dec.
i Iron Pig (Cleveland warrants) ..	per ton	51,3	2d. inc.
l ,, Wire, galv. No. 8, P.O. qual.	,,	£14	..
g Lead, English Pig	,,	£19 10 to £19 15	5s. inc.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£7	..
e Mica (in original cases) small ..	per lb.	6d. to 8s	..
e ,, ,, ,, medium	,,	8/6 to 6/-	..
e ,, ,, ,, large ..	,,	7/6 to 11/-	..
o Nickel, sheet, wire, &c.	,,	3/6 to 4/6 nom	..
p Phosphor Bronze, plain castings	,,	1/1 to 1/3½	..
p ,, ,, rolled bars & rods	,,	1/0½ to 1/3	..
p ,, ,, rolled strip & sheet	,,	1/2½ to 1/5½	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	10½d.	½d. dec.
r Steel, Magnet, in bars	per ton	£06	..
g Tin, Block (English)	,,	£143 to £144	£7 10 dec.
n ,, Wire, Nos. 1 to 16	per lb.	2,3	1d. dec.
p White Anti-friction Metals ..	per ton	£44 to £194	..
k Zinc, Sh't (Vieille Montagne bnd.)	,,	£25 2 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

SHARE LIST OF ELECTRICAL COMPANIES.

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations June 9th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	2/3 — 3/4	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	70 — 75	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	14⅞ — 16⅛	..	..
Do. Do. Deferred	100	..	..	7 — 9	+ ½	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	8⅝ — 9⅛	..	6 11 2
Do. 7 % Non-Cum. Pr'f.	100	8	3½	57 — 60	..	5 16 4
Do. 5 % Perp. Deb.	100	5	5	92½ — 94½	..	5 6 0
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 80	..	5 12 9
Central London Railway, Ord.	100	8	8	57 — 62	..	4 16 9
Do. Gtd. Assented	100	..	4	82 — 84	..	4 15 3
Do. Pref.	100	4	4	68 — 73	..	5 9 7
Do. Gtd. Assented	100	..	4	84 — 86	..	4 13 0
Do. Def.	100	2	2	40 — 45	..	4 9 0
Do. Gtd. Assented	100	..	4	80 — 82	..	4 17 7
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	95 — 97	..	5 3 1
Do. Do. 1896	100	5	5	91 — 94	..	5 6 5
Do. Do. 1901	100	5	5	89 — 92	..	5 8 8
Do. Do. 1903	100	5	5	89 — 92	..	5 8 8
Do. 4 % Deb.	100	4	4	86 — 88	..	4 11 0
Hastings Trams, 6 % Pref.	1	6	6†	15/16 — 31/32	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	65 — 70	..	6 8 7
Isle of Thanet Trams, 5 % Pref.	5	2½	3	2 — 2½	..	6 0 0
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	87 — 89	..	5 12 4
London and Suburban, Ord.	1	..	..	5/16 — 9/16	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	9/16 — 11/16	..	7 5 8
Do. Do. 4½ % 1st Deb.	100	4½	4½	75 — 80	..	5 12 5

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations June 9th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
London Elec. Railways, 4 % Deb.	100	4	4	90 — 92	..	4 7 0
London United Trams, 4 % Deb.	100	4	4	56 — 60	..	6 13 4
Metropolitan Railway Consol.	100	1⅛	1⅛	39⅛ — 39⅜	— ⅛	4 1 10
Do. Surplus Lands	100	2⅜	2⅜	19 — 61	—2	4 10 4
Do. 3½ % Deb.	100	3½	3½	87 — 89	..	3 18 7
Do. 3½ % Pref.	100	3½	3½	82 — 84	..	4 3 4
Do. 3½ % Con. Pref.	100	3½	3½	79 — 81	—1	4 6 4
Metropolitan District Ord.	100	Nil	..	2⅜ — 24½	+1	Nil
Do. 6 % Deb.	100	6	6	138 —141	..	4 5 3
Do. 4 % Deb.	100	4	4	93 — 95	..	4 4 1
Do. 4 % Prior Lien	100	4	4	96 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	83 — 86	..	5 4 8
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
Do. 5 % Deb.	100	5	5	85½ — 84½	..	5 18 0
Potteries, Ord.	1	3½	3½	3/32 — 1/8 xd	..	8 12 10
Do. 5 % Pref.	1	5	5	3/32 — 3/16	..	7 12 8
Do. 4½ % Deb.	100	4½	4½	81½ — 84½	..	5 6 2
South Metro. Trams, 4 % Deb.	100	4	4	66 — 70	..	5 14 4
Underground Elec. Railways	10	..	..	8⅜ — 8⅝	..	Nil
Do. "A"	1/-	..	..	1/8 — 3/16	..	Nil
Do. 6 % First Cum. Inc. Deb.	100	6	6	115 —117	..	5 2 7
Do. 4½ % Bonds	100	4½	4½	100 —102	+ ½	4 8 2
Do. 6 % Income	100	6	6	89 — 90	..	6 13 4
Yorkshire (West Riding), Ord.	5	Nil	Nil	1/16 — 1/8	..	Nil
Do. 6 % Pref.	5	3	4	4½ — 4¾	— ⅛	4 4 8
Do. 4½ % Deb.	100	4½	4½	84 — 87	..	5 3 6

ELECTRIC RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4⅜ — 5	+1/16	5 10 0
Do. 2nd Pref.	5	5½	5½	4 5/16 — 4 7/16	+1/16	6 2 3
Do. 4 % Deb.	100	4	4	92½ — 94½	..	4 4 8
Do. 4½ % Deb.	100	4½	4½	98½ — 101½	..	4 8 6
Do. 5 % Deb.	100	5	5	94½ — 96½	+ ½	5 3 6
Auckland Trams, 5 % Deb.	100	5	5	103 —106	..	4 14 3
Bombay Elec. S. & Trams, Pref.	10	6	6	11 — 11⅜	+ ⅛	5 2 2
Do. 4½ % Deb.	100	4½	4½	95 — 97	+ ½	4 12 9
Do. 5 % 2nd Deb.	100	5	5	99 —101	..	4 19 0
Brazilian Traction, Light and Power	$100	6	6†	80 — 82	— ½	7 5 5
Brisbane Trams Invt., Ord.	5	8	8	6⅝ — 7⅛ xd	..	5 12 3
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛ xd	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	98 —101	..	4 9 1
B. Columbia Elec. Rly., Def.	100	8	8†	110 —114	..	7 0 4
Do. Pref. Ord.	100	6	6	103 —107	..	5 12 1
Do. 5 % Pref.	100	5	5	103 —106	..	4 14 2
Do. 4½ % 1st Mort. Deb.	40	4½	4½	97 —100	..	4 10 0
Do. 4½ % Vancouver Deb.	100	4½	4½	94 — 98	..	4 12 0
Do. 4½ % Con. Deb.	100	4½	4½	94¼ — 96½	+1	4 8 1
Calcutta Trams, Ord.	5	7½	9½	6¾ — 7	..	6 15 9
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	97 — 100	..	4 10 0
Cape Electric Trams	1	5	5	3/4 — 3/2	..	6 13 4
City Buenos Aires Trams (1904)	5	5	5	5 1/16 — 5 1/8	..	4 11 11
Do. 4 % Deb.	100	4	4	93 — 98	+1	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90 — 94	..	5 6 8
Havana Elec. Rly., 5 % Bonds	$1000	5	5	93½ — 97½	..	5 2 6
Kalgoorlie El. Trams 5% A Deb.	100	5	5	84 — 89	..	5 12 4
Do. 6% B Deb.	100	3	..	10 — 20	..	Nil

La Plata Elec. Trams, Ord.	1	..	..	1/16 — 3/16	..	..
Do. Pref.	1	4½d.	6	3/16 — 5/16	..	6 5 0
Lisbon Elec. Trams, Ord.	1	6	6	1 3/16 — 1 1/4	..	4 9 3
Do. 6 % Pref.	1	6	6	1 5/16 — 1 3/8	..	5 1 0
Do. 5 % Deb.	100	5	5	95 —100	..	5 0 0
Madras Elec. Tr., 6% Cum. Pref.	5	6	6	4½ — 5½	..	5 14 3
,, Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17 0
Manaos Trams & Lt., 1st Deb.	100	5	5	78 — 81	..	6 3 5
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98½ —100½	..	4 19 6
Mexico Trams Com	$100	7	7	69 — 73	—2	..
Do. Gen. Con. 5 % Bonds	..	5	5	79 — 83	+1	6 0 6
Do. 6 % Bonds	100	6	8	77 — 81	+1½	7 8 2
Para Elec. Rlys. & Lt., Ord.	5	10	10	8½ — 4⅜	..	11 8 6
Do. 6 % Pref.	5	6	6	4 — 4½	..	6 13 4
Do. 5 % 1st Deb.	100	5	5	86½ — 89½	..	5 11 8
Rangoon El. Tr. & Sup., Pref.	5	5	5	5 — 5⅛	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97	..	4 12 9
Rio de Janeiro Trams, 1st Mort. & 5 % Bonds	..	5	5	98½ —100½	+ ½	4 19 6
Do. 5 % Mort. Bonds	100	5	5	89 — 91	+1	5 10 1
Sao Paulo Tram., Lt. and P. 5 % 1st Deb.	$500	5	5	95 — 99	+1	5 1 0
Singapore Trams, 5 % Deb.	100	5	5	88 — 92	..	5 8 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95 — 97	..	5 3 0
Un. Elec. Trams Monte Video	5	7	7	4⅝ — 5⅛	..	6 16 7
Do. 6 % Pref.	5	6	6	4¼ — 5½	..	5 14 3
Do. 5 % 1st Deb.	100	5	5	92 — 95	— ½	5 5 3
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	93½ — 95½	..	4 14 3

ELECTRICITY SUPPLY AND POWER COMPANIES.—HOME.

Bournemouth & Poole, Ord.	10	6	7	10 — 11	..	6 7 4
Do. 4½ % Pref.	10	4½	4½	9 — 10	..	4 10 0
Do. Second 6 % Pref.	10	6	6	10⅜ — 11⅞	..	5 10 4
Do. 4½ % Deb. Stock	Stock	4½	4½	95 — 98	..	4 11 9
Brompton & Kensington, Ord.	5	10	10	8⅞ — 9⅛	..	5 8 1
Do. 7 % Cum. Pref.	5	7	7	8¼ — 8⅝	..	4 0 0
Central Electric Supply, 4 % Guar. Deb.	100	4	4	89½ — 92½ xd	..	4 6 8
Charing Cross, West End & City	5	5	6	4⅞ — 5⅛	..	5 11 7
Do. 4½ % Cum. Pref.	5	4½	4½	4⅝ — 5	..	4 10 0
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 14 9
Do. Do. 4 % Deb.	100	4	4	92½ — 94½	+ ½	4 5 1
Chelsea, Ord.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % Deb.	Stock	4½	4½	97 —100	..	4 10 0
City of London, Ord.	10	9	10	16¼ — 17½	+ ½	5 16 0
Do. 6 % Cum. Pref.	10	6	6	12½ — 13½	..	4 9 0
Do. 5 % Deb.	Stock	5	5	116 —120	..	4 7 4
Do. 4½ % Second Deb.	100	4½	4½	100 —103	..	4 8 1
County of London, Ord.	10	6	7	11⅜ — 12½	..	5 14 8
Do. 6 % Pref.	10	6	6	11⅞ — 12⅝	..	4 17 0
Do. 4½ % Deb.	Stock	4½	4½	103 —106	..	4 5 8
Do. 4½ % Second Deb.	Stock	4½	4½	98 —101	..	4 9 1
Edmundson's, Ord.	£8	..	..	1/16 — 1/8	..	Nil
Do. 6 % Cum. Pref.	5	6	6	8¼ — 4	..	7 10 0
Do. 6 % Non-Cum. Pref.	5	..	..	1⅝ — 2	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	—1	5 4 6
Folkestone	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % First Deb.	100	4½	4½	93 — 95	..	4 14 9

Hove	5	8	9	8¾ — 9	..	5 0 0
Kensington & Knightsbridge, Ord.	5	8	9	7⅞ — 7⅞	— ⅛	5 14 3
Do. 4 % Deb.	Stock	4	4	90 — 92	..	4 7 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	76 — 80	..	6 12 0
London Electric, Ord.	3	2½	3	1⅛ — 1⅜	— ⅛	5 10 7
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 14 3
Do. 4 % First Mort. Deb.	Stock	4	4	92½ — 96½	..	4 3 9
Metropolitan	5	4½	4½	8¼ — 8⅝	..	6 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¾ — 5	..	4 10 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	97 —100	..	4 10 0
Do. 3½ % Mort. Deb.	Stock	3½	3½	83 — 86	..	4 1 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101	..	4 19 1
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9⅞ — 10⅛	..	5 14 3
Oxford	5	7	7	5 1/32 — 6 1/32	..	5 11 0
St. James' and Pall Mall, Ord.	5	10	12	9⅛ — 10	..	6 0 0
Do. 7 % Pref	5	7	7	6⅞ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	83 — 86	..	4 1 4
South London, Ord.	4	5½	5½	2⅞ — 3⅛	..	6 10 4
Do. 5 % First Mort. Deb.	100	5	5	99 —102	..	4 18 0
South Metropolitan, 7 % Pref.	1	7	7	1 3/16 — 1 5/16	..	5 6 8
Do. 4½ % First Deb. Stock	100	4½	4½	97 — 100	..	4 10 0
Urban, Ord.	£8	Nil	..	1/16 — 1/8	..	..
Do. 5 % Cum Pref.	5	8‡	4	2½ — 3	..	6 13 4
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	..	5 4 8
Westminster, Ord.	5	10	10	8½ — 8⅝	..	5 14 3
Do. 4½ % Cum Pref.	5	4½	4½	4 15/16 — 5 1/16	..	4 6 9

* Unless otherwise stated, all shares are fully paid. † Interim Dividend. ‡ And Funded Certs.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued.)*

ELECTRICITY SUPPLY AND POWER—COLONIAL AND FOREIGN.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 9th.	Rise + or Fall —	Present Yield p.c.
Adelaide, 6 % Pref.	£5	6	6	5¼ — 5⅝	..	£ s. d. 5 11 7
Calcutta, Ord.	£5	8½	9	7⅛ — 7½	—1	5 14 6
Do. 5 % Pref.	£5	5	5	5 1/16 — 5 5/16	..	4 14 1
Calgary Power, 1st Mort. Bds. ..	100	5	5	90¾ — 92⅜	..	5 8 0
Canadian Gen. El. Com.	$100	7	8	103 —108	..	7 5 6
Do. 7 % Pref.	$100	7	7	118 —123	+1	5 13 10
Cordoba Lt., Power and T., Ord.	£1	5	..	7/16 — 1/2	..	7 12 0
Do. 5 % Deb.	100	5	5	87 — 90	..	5 11 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	84 — 89	+1	6 14 10
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	91 — 94	..	5 6 5
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	93½—95½	..	5 4 9
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	3/16 — 5/16	..	Nil
Do. 6 % Pref.	£1	6	4	1/2 — 3/4	..	8 0 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	103 —105	..	4 15 2
Madras, Ord.	£5	Nil	..	1¼ — 1⅝	..	.
Melbourne, 5 % 1st Mort. Deb. ..	100	5	5	105 —108	..	4 12 6
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	61 — 66	..	7 11 6
Mexican Lt. & Power, Common	$100	4	4†	43 — 47	..	..
Do. 7 % Cum. Pref.	$100	7	7	71 — 75	..	9 6 8
Do. 5 % 1st Mort. Gold Bds.	..	5	5	72 — 77	—1	6 9 10
Do. 5 % 2nd Mort. Bonds ..	100	5	5	59 — 64 xd	..	7 13 3
Monterey Rly., Light & Power, 5 % 1st Mort. Deb.	* 100	1913. 5	1913. 5	51 — 55	..	£ s. d. .. ..
Montreal, Lt., H. and Power ..	$100	9	10†	226 —231	+ 1	4 6 7
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	5a	10 — 20	..	.
River Plate, Ord.	Stock	10	10	235 —245 xd	..	4 1 8
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	97 —103	..	5 16 6
Do. 5 % Deb. Stock	Do.	5	5	101 —103	..	4 17 0
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 8
Shawinigan Water, Capital ..	$100	5½	6	133 —137	..	4 7 7
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 7
Do. 4½ % Per. Deb.	Stock	4½	4½	99½ —101½	..	4 8 8
Toronto Power, 4½ % 1st Deb. ..	Do.	4½	4½	98 —100 xd	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	85 — 87	..	5 15 0
Victoria Falls Power, Pref. ..	1	6	6	23/32 — 25/32	..	7 13 4
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 — 105	..	5 14 3

MANUFACTURING COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 9th.	Rise + or Fall —	Present Yield p.c.
Arom, Ord.	£1	7	..	3/32 — 5/32	..	£ s. d. 8 5 0
Do. 6 % Pref.	£1	6	6	3/32 — 5/32	..	6 17 2
Babcock & Wilcox	£1	16	16	21/32 — 23/32	..	5 4 7
Do. Pref.	£1	6	6	1/4 — 5/16	..	4 7 6
British Aluminium, Ord.	£1	..	5	1/16 — 1/8	..	4 14 1
Do. 6 % Cum. Pref.	£1	6	6	1/32 — 1/16	..	6 8 0
Do. 5 % Prior Liens Debs. ..	100	5	5	97 —100	..	5 0 0
Do. Deb. Stk.	100	5	5	90 — 95	..	5 5 3
B.I. & Helsby Cables	£5	10	13	9/32 — 9/32	+ 1/4	6 11 8
Do. Pref.	£5	6	6	5/16 — 6/32	..	4 14 1
Do. Deb.	100	4½	4½	101 —104	..	4 6 9
British Thomson-Houston, Deb.	100	4½	4½	92 — 94	..	4 15 9
British Westinghouse, Pref. ..	£2	Nil	5	1 1/16 — 1 1/16	+ 1/32	5 3 1
Do. Deb.	100	4	4	73 — 75	..	5 6 8
Do. 6 % Prior Lien	100	6	6	101 —104	..	5 16 6
Browett, Lindley, Ord.	£1	..	..	2/- —8/-	..	Nil
Do. Pref.	£1	..	..	8/- —8/6	..	Nil
Brush, 7 % Pref.	£2	Nil	..	0 — 1/2	..	Nil
Do. 5 % Prior Lien Deb. ..	100	5	5	80 — 85	..	5 17 8
Do. 4½ % Deb.	100	4½	4½	50 — 55	..	8 3 8
Do. 4½ % Second Deb. ..	100	4½	4½	29 — 33	..	13 12 8
Callender's Cable	£5	15	15	11⅝ — 12½	..	6 3 8
Do. Pref.	£5	5	5	5 — 5½	..	4 16 6
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Castner-Kellner	£1	20	22½	23/32 — 25/32	..	8 11 5
Do. Deb.	100	4½	4½	104 —107	..	4 4 1
Crompton & Co., Deb.	100	5	5	83 — 85	..	5 17 8
Dick, Kerr	£1	Nil	..	3/32 — 5/32	..	..
Do. Pref.	£1	6	6	5/16 — 7/16	..	6 17 2
Edison & Swan, A, £2 paid	£5	Nil	..	0 — 1/8	..	Nil
Do. fully paid	£5	Nil	..	1 — 1½	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	61 — 66	..	7 11 6
Electric Construction	£1	5	6	3/16 — 1/4 xd	..	8 14 6
Do. Pref.	£1	7	7	1 — 1⅛	..	6 4 5
Greenwood & Batley, Pref. ..	£10	7	7	6¾ — 7¼	..	9 13 2
Do. Deb.	100	5	5	92 — 94	..	5 6 5
General Electric, 6 % Pref. ..	£10	6	6	10 5/16 — 10 3/16	..	5 13 9
Do. Deb.	100	4	4	87 — 91	..	4 8 0
Henley's, Ord.	£5	15	20	14½ — 15½	..	6 9 0
Do. Pref.	£5	4½	4½	4⅞ — 5⅛	..	4 7 10
Do. Deb.	100	4½	4½	99½ —101½ xd	..	4 8 8
India-Rubber, G. & T.	£10	7½	7½	9⅞ — 10⅛	..	6 19 5
Do. Pref.	£10	5	5	8⅞ — 9⅛	..	5 5 8
Telegraph Construction	£12	20	20	36¾ — 38½	..	6 4 7
Do. Deb.	100	4	4	98 —100	..	4 0 0
Willans & Robinson, 4 % 1st Mort. Deb.	100	4	..	63 — 67	..	5 19 8
Do. B 4 % Cum. Pref. ..	100	..	£4	40 — 44	..	9 1 10

TELEGRAPH AND TELEPHONE COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 9th.	Rise + or Fall —	Present Yield p.c.
Amazon Telegraph	£10	4½	4½	5⅜ — 6½	..	£ s. d. 7 4 0
Do. 5 % Deb. Red.	Stock	5	5	94 — 97	..	5 3 0
American Telep. & Teleg., Cap.	$100	8	8	123 —127	..	6 6 0
Do. Collat. Trust ..	$1000	4	4	91 — 94	..	4 5 0
Anglo-American Telegraph ..	Stock	3	3	64 — 67	..	4 9 7
Do. 6 % Pref.	Do.	6	6	108 —109	— 1/2	5 10 1
Do. Def.	Do.	80/-	80/-	23 — 23½	..	6 7 8
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	£5	8	6†	7⅞ — 7⅞	..	5 6 8
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	7 — 81	..	4 18 9
Cuba Telegraph	£10	6	6†	8½ — 9¼ xd	..	6 6 4
Do. 10 % Pref.	£10	10	10	16 — 17	..	5 17 8
Direct Spanish Telegraph, Ord.	£5	4	4	3¾ — 4	..	5 0 0
Do. 10 % Cum. Pref.	£5	10	10	7⅞ — 7⅞	..	6 0
Direct United States Cable ..	£10	4	4	6⅝ — 6⅞	..	5 16 4
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	129 —132	— 1	5 6 3
Do. 8½ % Pref. Stock	Do.	8½	8½	77 — 79	..	4 8 9
Do. 4 % Mort. Deb.	Do.	4	4	94 — 96	..	4 3 4
Eastern Extension	£10	7	7	12⅝ — 13	..	5 7 9
Do. 4 % Deb.	Stock	4	4	94¼ — 96¼	..	4 3 0
Globe Telegraph and Trust ..	£10	6	6†	10⅞ — 11⅛	..	5 5 4
Do. 6 % Pref.	£10	6	6	12⅜ — 12⅝	..	4 13 4
Great Northern Telegraph ..	£10	20	20	31 — 33	..	6 1 1
Indo-European Telegraph ..	£25	13	13	56½ — 58½	..	5 11 1
Mackay Companies Common ..	$100	5	5	81 — 84	..	5 19 1
Do. 4 % Cum. Pref.	$100	4	4	68 — 71	..	5 12 7
Marconi's Wireless Telegraph ..	£1	20	20	2⅜ — 2⅞	— 1/4	6 19 0
Do. 7 % Cum. Partic. Pref. ..	£1	17	..	2 5/16 — 2 7/16	— 5/16	6 19 0
Monte Video Telephone, Ord. ..	£1	6	6	1/8 — 1/8	..	6 8 0
Do. 5 % Pref.	£1	5	5	3/32 — 3/32	..	5 18 6
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	99½ —100¾	+ 1/2	4 9 6
Oriental Telep. and Elec. ..	£1	10	10	2 1/16 — 2 3/16	..	4 6 7
Do. 6 % Cum. Pref.	£1	6	6	1 3/8 — 1 5/8	..	4 13 5
Do. 4 % Red. Deb.	Stock	4	4	87½ — 89½	..	4 9 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	4 0 0
Reuter's	£10	10	7	7⅞ — 8¼	— 1/2	8 0 0
Submarine Cables Trust	Cert.	6	6	126 —129	..	4 13 7
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	98 —100	..	4 10 0
United River Plate Telephone	£5	8	6†	6½ — 6⅝	..	5 18 5
Do. 5 % Cum. Pref.	£5	5	5	5⅛ — 5⅜	..	4 9 0
West Coast of America	£1	2½	N	1/8 — 1⅛	..	Nil
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	£10	1½	1½	1¼ — 1⅜	..	7 2 10
Do. 6 % Cum. 1st Pref. ..	£10	6	6	9¼ — 9⅝	..	6 3 1
Do. 6 % Cum. 2nd Pref ..	£10	6	6	8¾ — 9	..	6 13 4
Do. 5 % Debs.	100	5	5	97 — 99	..	5 1 0
Western Telegraph, Ltd. ..	£10	7	7	13⅛ — 13⅜	..	5 1 11
Do. 4 % Debs.	Stock	4	4	95¼ — 97½	..	4 2 1
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	94 — 97	..	4 12 9

* Unless otherwise stated all shares are fully paid. † Interim dividend. *a* Paid in deferred interest warrants.

Bank rate of Discount 3 per cent., January 29th, 1914.

Staff Dinner.—On Saturday last, at the Holborn Restaurant, the ELECTRICAL APPARATUS CO., LTD., held the first of what it is intended shall be a series of annual staff dinners. This festivity was preceded on Friday by the more serious business of the Convention, attended by the district office managers from Manchester, Birmingham, Glasgow and Cardiff, and by the sales staff attached to the head office. It is found desirable to hold these Conventions quarterly in order to keep the outside representatives in touch with the developments in manufacture. On Saturday the annual staff photograph was taken, and this shows an increase of 40 per cent. in the size of the staff, which now numbers 100. The programme which followed the dinner consisted entirely of amateur talent, which met with due appreciation; a topical song, written and sung by Mr. Elstone, of the testing department, was well received.

Child Culture.—At the recent conference of the Child Study Association, Sir J. Crichton Browne deprecated experiments on the effect of electricity on the growth of children, fearing that harmful results might manifest themselves in later years. It is known, however, that electrification produces excellent results in the case of chickens, whose growth is accelerated 35 per cent. by the treatment, while their vitality and health appear to derive distinct benefit from it.

Secret Wireless Telegraphy.—Captain A. N. Hovland, of the Norwegian Navy, whose keyboard transmitting and receiving apparatus was described in our issue of September 15th, 1911, has continued his experiments, and is reported to have developed a sensitive relay, depending upon the properties of the selenium cell, for use in connection with his system. By means of codes which are automatically deciphered by the receiving apparatus, the inventor claims to secure secrecy in transmission.

TRADE STATISTICS OF EGYPT, 1913.

The following statement, showing the imports of electrical and similar goods into Egypt during the year 1913, is taken from the recently-issued trade statistics. The figures for 1912 are added for purposes of comparison, and notes of any increases or decreases are given:—

	1912. £E.	1913. £E.	Inc. or dec. £E.
Steam engines, including boilers, &c.—			
From Great Britain ...	97,000	127,000	+ 30,000
,, Germany ...	15,000	7,000	− 8,000
,, Belgium ...	—	1,000	+ 1,000
,, France	4,000	8,000	+ 4,000
,, United States ...	1,000	1,000	—
,, Holland	2,000	5,000	+ 3,000
,, Italy	8,000	11,000	+ 3,000
,, Switzerland ...	5,000	2,000	− 3,000
,, Austria-Hungary	15,000	20,000	+ 5,000
,, Other countries	3,000	—	− 3,000
Total ...	150,000	182,000	+ 32,000
Electric machinery (including gas engines and petrol engines).—			
From Great Britain ...	78,000		
,, Germany ...	32,000		
,, Austria	9,000		
,, Belgium	3,000	Shown	
,, United States ...	7,000	separately	
,, France	6,000	below.	
,, Italy	12,000		
,, Switzerland ...	32,000		
,, Other countries	2,000		
Total ...	181,000		
Electric machines.—			
From Great Britain ...		15,000	—
,, Germany ...		8,000	—
,, Austria	Not	3,000	—
,, Belgium	shown	6,000	—
,, United States ...	separately,	3,000	—
,, France	see	27,000	—
,, Italy	above.	3,000	—
,, Switzerland ...		1,000	—
Total ...		66,000	—
Gas and Petrol Engines.—			
From Great Britain ...		62,000	—
,, Germany ...	Not	31,000	—
,, France	shown	1,000	—
,, Holland	separately,	1,000	—
,, Italy	see	22,000	—
,, Sweden	above.	1,000	—
,, Switzerland ...		28,000	—
Total ...		146,000	—
Other machinery (except agricultural).—			
From Great Britain ...	88,000	103,000	+ 15,000
,, Germany ...	49,000	36,000	− 13,000
,, Austria	4,000	7,000	+ 3,000
,, Belgium	4,000	4,000	—
,, United States ...	42,000	30,000	− 12,000
,, France	39,000	36,000	− 3,000
,, Italy	3,000	5,000	+ 2,000
,, Switzerland ...	4,000	9,000	+ 5,000
,, Turkey	2,000	1,000	− 1,000
,, Other countries	3,000	2,000	− 1,000
Total ...	238,000	233,000	− 5,000
Railway and tramway carriages.—			
From Great Britain ...	22,000	2,000	− 20,000
,, Austria	42,000	21,000	− 21,000
,, Belgium	28,000	20,000	− 8,000
,, Other countries	7,000	4,000	− 3,000
Total ...	99,000	47,000	− 52,000
Lamps of all kinds.—			
From Great Britain ...	7,000	6,000	− 1,000
,, Germany ...	20,000	21,000	+ 1,000
,, Austria	32,000	29,000	− 3,000
,, Belgium	1,000	—	− 1,000
,, Frances	11,000	6,000	− 5,000
,, Italy	1,000	1,000	—
,, Sweden	6,000	7,000	+ 1,000
,, Other countries	1,000	3,000	+ 2,000
Total ...	79,000	73,000	− 6,000

	1912. £E.	1913. £E.	Inc. or dec. £E.
India-rubber and gutta-percha, raw or manufactured.—			
From Great Britain ...	8,000	12,000	+ 4,000
,, Germany ...	16,000	15,000	− 1,000
,, Austria	4,000	4,000	—
,, France	12,000	8,000	− 4,000
,, Italy	3,000	10,000	+ 7,000
,, Switzerland ...	1,000	—	− 1,000
,, Belgium	1,000	1,000	—
,, Other countries	1,000	2,000	+ 1,000
Total ...	46,000	52,000	+ 6,000
Electric, telegraphic and telephonic apparatus.—			
From Great Britain ...	57,000	46,000	− 11,000
,, Germany ...	20,000	25,000	+ 5,000
,, Austria	26,000	15,000	− 11,000
,, Belgium	5,000	7,000	+ 2,000
,, United States ...	1,000	1,000	—
,, France	13,000	19,000	+ 6,000
,, Italy	3,000	3,000	—
,, Sweden	5,000	18,000	+ 13,000
,, Switzerland ...	3,000	4,000	+ 1,000
,, Other countries		1,000	+ 1,000
Total ...	133,000	139,000	+ 6,000
Scientific instruments.—			
From Great Britain ...	17,000	20,000	+ 3,000
,, Germany ...	16,000	21,000	+ 5,000
,, Austria	1,000	1,000	—
,, United States ...	2,000	2,000	—
,, France	13,000	14,000	+ 1,000
,, Italy	1,000	1,000	—
,, Switzerland ...	1,000	1,000	—
,, Other countries	2,000	2,000	—
Total ...	53,000	62,000	+ 9,000
Rails.—			
From Great Britain ...	35,000	106,000	+ 71,000
,, Germany ...	60,000	20,000	− 40,000
,, Belgium	21,000	59,000	+ 38,000
,, France	—	—	—
Total ...	116,000	185,000	+ 69,000
Copper, hammered, drawn or sheet.—			
From Great Britain ...	160,000	96,000	− 64,000
,, Germany ...	11,000	15,000	+ 4,000
,, Belgium	2,000	1,000	− 1,000
,, France	11,000	1,000	− 10,000
,, Other countries	—	—	—
Total ...	184,000	113,000	− 71,000
Copper, manufactured.—			
From Great Britain ...	17,000	11,000	− 6,000
,, Germany ...	16,000	20,000	+ 4,000
,, Belgium	1,000	3,000	+ 2,000
,, France	18,000	17,000	− 1,000
,, Italy	7,000	6,000	− 1,000
,, Other countries	2,000	2,000	—
Total ...	61,000	59,000	− 2,000

£E = £1 0s. 6½d.

LEGAL QUESTIONS AS TO ELECTRICAL FITTINGS.

[FROM A LEGAL CONTRIBUTOR.]

Change of occupancy of a house hardly ever takes place without the occurrence of some question relating to electrical fittings. Either the outgoing or incoming tenant has some question to raise with regard to them, or else a question of greater or less moment arises with the landlord.

It is proposed in the present article to consider some of the points which arise from time to time.

Sec. 24 of the Electric Lighting Act, 1882, provides that any officer appointed by the undertakers, may at all reasonable times enter any premises to which electricity is, or has been, supplied by the undertakers, in order to inspect the electric lines,

meters, accumulators, fittings, works, and apparatus for the supply of electricity belonging to the undertakers, and for the purpose of ascertaining the quantity of electricity consumed or supplied, or where the undertakers are authorised to take away or cut off the supply of electricity from any premises, for the purpose of removing any electric lines, accumulators, fittings, works, or apparatus belonging to the undertakers, repairing all damage caused by such entry, inspection, or removal. The powers conferred by this section must not, however, be arbitrarily exercised. Due notice of an intended visit should be given, for it was decided in *Brompton Electricity Supply Co. v. Shadforth* (Electrical Review, July 24th, 1903) that where a consumer refused to allow inspectors to come into her house unless she received previous notice of their visit, an injunction ought not to be granted to restrain her. Electric fittings are also protected from distress for rent. Thus by Sec. 25 of the Electric Lighting Act, 1882, where any electric lines, meters, accumulators, fittings, works, or apparatus belonging to the undertakers (*i.e.*, the local authority or company supplying electricity) are placed upon any premises for the purpose of supplying electricity, they shall be subject to protection. In the ordinary way they might be seized by the landlord whose rent was in arrear; but this section provides that they shall not be subject to distress, or to the landlord's remedy for rent of the premises where the same may be, nor be taken in execution under any process of a Court of law or equity, or any proceedings in bankruptcy against the person in whose possession the same may be. This affords considerable protection to the undertakers. Very often when a tenant does a "moonlight flit" the only articles of vertue left on the premises are the electrical fittings, which the landlord would be glad to sell in order to satisfy some part of his claim for rent outstanding.

But what are fittings within the meaning of this section? Wires, and pipes through which wires are carried, naturally come under this heading, but there are other things not so easy to classify. It was decided under Sec. 14 of the Gasworks Clauses Act, 1871, which is similar to the above, that a gas stove let for hire is a "fitting for the gas "within the meaning of the section, and is therefore not subject to distress for rent (*see Gas Light and Coke Co. v. Hardy*, 1886, 17 *Q.B.D.* 619). It would seem to follow from this that electric stoves, kettles, motors, fans and electric irons, if hired out by the supply authority to the consumer, would not be subject to distress by the landlord.

A nice question may sometimes arise as to whether electric fittings let on hire by the supply authority vest in the trustee in bankruptcy of the consumer. The law of bankruptcy provides that goods which are in the order and disposition of the bankrupt, with the consent of the true owner at the date of his bankruptcy, shall vest in the trustee for the benefit of his creditors. And this is right; for credit is naturally given to a man upon the strength of the goods which he has on his premises. But where it is well known that certain classes of goods are customarily lent on hire, the presumption that they belong to the bankrupt does not arise. For instance, the custom of hotel-keepers to hire furniture is so well known that such furniture does not vest in the trustees in bankruptcy of the hotel proprietor. It has long been the practice of gas companies to hire out gas stoves to consumers; and questions arise from time to time as to the power of local authorities supplying electricity to deal in fittings. It is common to find in the Acts of local authorities a special clause enabling them to sell, hire, let, but not to manufacture, lamps, meters, electric fittings, etc. The terms of such clauses vary somewhat. In the Nottingham Corporation Act, 1899, Sec. 4., the power conferred is to provide and let, etc., but not to manufacture "lamps, meters, electric lines, fittings, apparatus and things for lighting and motive purposes for which electric energy can or may be used, or otherwise necessary or proper for the distribution, consumption or use of electrical energy."

The Manchester Corporation (General Powers) Act, 1898, after the usual wide powers, contains these words: "Electrical motors and apparatus for the use of electricity for motive power and other purposes." The Halifax Corporation Act, 1898, is even wider in its terms. It authorizes the Corporation to "purchase, hire, sell, let on hire, or otherwise deal with dynamos, electric motors, accumulators, meters, plant, engines, conductors, machinery, apparatus and appliances for and in relation to the production, supply, distribution or utilisation of electricity, or required or used for or in connection with their electrical works and undertaking. . . ."

The case of the *Attorney-General v. The Mayor, etc., of Barnstaple* (Electrical Review, Vol. 52, p. 766) showed clearly that it is not competent for an electrical company supplying electric light to supply electric fittings without an express provision to that effect in the Act under which they work. It appeared that in 1900 the defendant Corporation obtained from the Board of Trade a provisional order. In the summer of 1902 they circularised the ratepayers, and gave out that they were prepared to supply electric fittings, and fit them up in private houses. Two ratepayers moved the Attorney-General to bring an action, and as a result of the litigation the Corporation consented to the following order: "The Corporation undertake not to do any further installations for customers, or to expend further moneys on private installations except in pursuance of obligations already entered into."

The question whether a tenant for life has power to lay down and charge out of capital for electric plant put in by him has been considered in many cases. In *re* Lord Leconfield's Settled Estates, which was heard by Mr. Justice Kekewich some years ago, a summons was taken out under the Settled Lands Acts by the tenant for life in possession of the certain settled estates in England, asking that the trust might be directed to apply certain capital moneys in their hands in recouping the applicant the following sums expended by him out of his own moneys:—(1) £4,891 19s. 7d. for the construction of a new drainage system for the principal mansion house; (2) £3,299 9s. 10d. for the erection of an engine house for the engines which supplied the principal mansion house with electric light. The Settled Lands Act, 1882, Sec. 25, provides that improvements authorized by the Act to be made with capital trust moneys are works for (Sub-Sec. [1]) drainage and (Sub-Sec. [2]) saw mills, scutch mills and other mills, waterwheels, engine houses and kilns, which will increase the value of the settled land for agricultural purposes, or as to woodland or otherwise. It was held, that assuming that the engine house would increase the value of the settled land, taking settled land to include the principal mansion house, yet it would not increase its value "for agricultural purposes or as woodland or otherwise" within the meaning of the Sub-Secs. 1 and 2, and that its expense could not therefore be allowed out of capital moneys; but it was held also that the cost of the new drainage system could be allowed, for it was not a case of a mere addition but a completely new system and a permanent improvement. This decision appears to be somewhat incomprehensible to the non-legal mind. The tenant for life was allowed to spend a considerable sum of money on the drains for the house, but was not permitted to put down an electric lighting plant.

Yet in the existing conditions of modern society it is almost a *sine qua non* that a country gentleman's house shall be properly lit. A glance at the date of the Settled Lands Act is sufficient to explain this anomaly. That measure was passed in the same year as the first Public Electric Lighting Act. At

that time electricity was in its infancy, and the fact that it has long since come to stay, and that, as a source of light it is practically a common necessity, ought to afford justification for an amendment of the Settled Lands Act. A short section might easily be drafted which would give the Court power to decree that a tenant for life may spend part of his capital on electric lighting.

The point was again raised in the case of *re* Blagrave's Settled Estates (Electrical Review, Vol. 52, p. 383). Mr. Justice Joyce held (following Mr. Justice Buckley in *re* Clark, 1902, 2. Ch. 327) that this was not an improvement which could be paid for out of capital within the meaning of the Settled Lands Act (Sec. 25). When the case came before the Court of Appeal, this decision was upheld, but Lord Justice Cozens-Hardy threw out the interesting suggestion that it would be desirable to extend the Acts so as to allow provision to be made for supplying gas or electric lighting to a mansion house. This, however, was a matter for the Legislature, not for the Court to decide.

Under the heading "Electric Fittings" the questions affecting the validity and effect of the free wiring agreement appear to find a proper place. In the *London Electric Supply Corporation, Ltd., v. Priddis* (18 T.L.R. 64) an agreement made between the plaintiffs, the National Electric Free Wiring Co., Ltd., and the defendant on February 17th, 1898, contained (*inter alia*) the following clauses: "(2) The Wiring Co. will in a proper manner and in accordance with the regulations of the fire insurance companies, and free of cost to the consumer, furnish and fit up on the said premises the necessary wires and fittings for electric lighting, hereinafter called the installation." Clause 4 gave the consumer an option of purchase in a certain event. Clause 7 provided: "The consumer shall until purchase as aforesaid pay quarterly to the supply company for the use of the installation ¾d. per Board of Trade unit for every unit of electrical energy supplied to the said premises, and the minimum payment in any year shall be 1s. for each 8-c.p. lamp or its equivalent installed." Clause 8 provided for recovery in case of non-payment. The defendant used no electricity supplied by the plaintiffs from June to September, 1900. They sued in the County Court for the sum of £1 6s. 3d., being the minimum provided by Clause 7 supra. It was held, on appeal, that the installation had clearly been put in on the terms that the customer should have the right to purchase after five years, and that during those years he was liable to pay a minimum rent, whether he used the current or not. The case was sent back for a new trial.

Of all electric fittings to be found on the consumer's premises, the meter, which is usually hired out to him by the company, is likely to be productive of the greatest amount of trouble.

The register of a gas meter is *prima facie* evidence of the quantity consumed, and two justices are empowered to settle differences between the company and the consumer. (See 34 and 35 Vict. c. 41, Sec. 23.) In the case of the Gas Light and Coke Co. *v.* Cree, 1897, 61 J.P. 699, it was laid down that where the only evidence of the amount is afforded by the meter, the Court will be unwilling to go behind it. There is no reported case in which a complainant has challenged the accuracy of a meter by appealing to an independent authority.

In the case of electricity supply, the meter register is still more conclusive. If any difference arise between consumer and the undertakers as to whether any meter whereby the value of the supply is ascertained (whether belonging to the consumer or to the undertakers) is, or is not, in proper order for correctly registering the value, or as to whether the value has been correctly registered at the meter, that difference is to be determined upon the application of an electric inspector, or, where the local authority are the consumers, by an inspector appointed by the Board of Trade. The inspector has jurisdiction over the costs of the inquiry, and his finding is conclusive and binding on the parties. Subject to the inquiry the register of an electric meter is conclusive evidence of the value of the supply in the absence of fraud. (Electric Lighting [Clauses] Act, 1899, Sec. 57).

As to the finality of the decision of a Government Inspector it is worthy of note that in the case of the Wandsworth and Putney Gas Co. *v.* Rye (31 Sol. J. 633) the accuracy of a gas meter, sworn to be perfectly accurate by a Government inspector, was successfully disputed, not by the production of any expert evidence, but merely by the sworn testimony of the plaintiff and his servants, who deposed that less gas had been used in the quarter immediately preceding that for which the company sought to charge. The authority of this decision, which comes from an inferior court, is doubtful.

Should the methods of supply and charge be altered, undertakers are bound to defray the expense of providing new meters to their consumers (Electric Lighting [Clauses] Act, 1899, Sec. 58). It sometimes happens that a serious defect in a meter remains undiscovered over a long period of time. The consequence is that a consumer may be overcharged or—as more rarely happens—considerably undercharged for the amount of gas or other commodity consumed by him. In such circumstances there is authority for saying that in so far as any claim is not barred by the Statute of Limitations (which prevents a debt being recovered after a lapse of six years) the injured party is entitled to redress. In the case of the South Metropolitan Gas Co. *v.* The Mayor, etc. of Bermondsey (*The Times*, May 18th, 1901), an action was brought to recover the sum of £884, the price of gas supplied to the Commissioners of Baths and Washhouses in Rotherhithe (the predecessors of the defendants) from 1894 to 1900. Owing to the fact that the dial of the meter in use during that period was misleading, the amount of gas charged for was but one-tenth of the actual amount consumed. The mistake had existed since 1885, but the claim for arrears which had accrued prior to 1894 was barred by the Statute of Limitations. The defendants admitted the mistake, but sought to escape liability on the ground (*inter alia*) that they could not make or levy a retrospective rate for the purpose of discharging the debt, nor could they apply the moneys in their hands derived from current rates in payment thereof. This defence, however, did not prevail, and they were held liable for the arrears which were not barred by the Statute.

A meter belonging to the undertakers which is placed upon any premises not being in the possession of the undertakers for the purpose of supplying electricity, is not subject to distress for rent; that is to say, the consumer's landlord could not distrain upon it. The same rule applies to "electric lines, accumulators, and fittings." (Electric Lighting Act, 1882, Sec. 25.) "Fittings" as applied to the property of a gas company have been held to include a gas stove (Gas Light and Coke Co. *v.* Hardy, 17 Q.B.D. 619). An electric stove or an electric motor would probably come under the same heading, and would, therefore, be protected.

A Heating Studentship.—A "heating" studentship, tenable in the Faculty of Engineering of University College, London, of the value of £50 a year, together with £11 11s., being the amount of college fees, may be awarded by the Institution of Heating and Ventilating Engineers in July. The student will be required to devote his whole time to research work in heating and ventilating engineering. Further particulars can be obtained from the Secretary of University College, to whom application should be made on or before Saturday, June 20th.

MUNICIPAL ELECTRICAL UNDERTAKINGS: RECORDS FOR FUTURE USE.

BY "INTERESTED."

"THE past is a lesson, the present a fact, and the future is that which can be made." The future, however, cannot be judged by the past. Those who have benefited by this teaching are now putting their learning into practical use. In the past mistakes have been made; errors into which some have fallen have been rectified, and precautions have been taken to prevent their recurrence. This is fact—the present. Accepted rules have been drafted because of a lesson, but many of these regulations will need redrafting in the future. That future has yet to be made. What is in store for us none can foresee; but one important point always to be borne in mind is that all will be exactly as we make it.

To all appearance, the future before the electrical industry, particularly the electricity supply branch, now shines rich and bright; yet upon the foundation laid to-day—the present—will success depend. There is a vast field undeveloped and awaiting the attention of central-station engineers and managers. Take London only, or Greater London for preference: what a future! How many thousands of business people there are who have not made use of electricity to reduce manual labour! How many thousands of private houses to which the blessings of electricity are as yet unknown!

What of the future? The errors which have been made in the past will carefully be avoided, but it is too much to hope that no mistakes will again occur. It is well to have a care for to-morrow—and beyond.

These remarks have been amply illustrated by the central-station engineer who uses the method described below for registering exactly the whereabouts of his electricity meters. The past is recorded, the present stock of new and old instruments is shown, and likewise the number on circuit.

METER TESTS.

Date.	Meter No.	Type.	Amps.	Volts.	Full load.			Half-load.			Tenth-load.			Percentage errors.			Starting test.	Stop test.	Remarks.
					Rdg. at start.	Rdg. at finish.	Diff. in units.	Rdg. at start.	Rdg. at fini-h.	Diff. in units.	Rdg. at start.	Rdg. at finish.	Diff. in units.	Full load.	Half-load.	Tenth-load.			

No. 1.

METERS REMOVED.								METERS FIXED.					
Date.	Address.	Type.	Number.	Size.	Reading.	Removed by	Why removed	Date.	Address.	Type.	Number.	Size.	Reading.	Fixed by	Why fixed

No. 2.

RECORD OF CHECK METERS.

Name and address.	Date.	Size.	Type.	Check meter rdg.	Advance.	Size.	Type.	Old meter reading.	Advance.	% error.	Remarks.

No. 4.

METER SUMMARY.

Week ending .....

Type	No. fixed during week.	No. removed dur'g wk.	No. delivered dur'g wk.	No. fixed.	No. in stock (good).	No. in stock (faulty)	No. sold.	Total No. purchased.

No. 3.

RECORD OF MOTORS.

Date.	Address.	H.P. of motor.	Maker's name.	Description of machinery driven.

No. 5.

Form No. 1 is for keeping a record of all tests carried out on both new and old meters.

No. 2 represents a day book for entering details of each instrument fixed on consumers' premises.

No. 3 is a weekly summary showing the exact stock in hand, the number of meters out on circuit, the number of old instruments sold, and the number purchased from the commencement of the undertaking.

Arc Lamp HIRE A/c.

Supplied by *White & Co.* Date *22/2/12.* CARD No. *4*

No. of Articles received *Six* Rate *£5* Depreciation *33⅓ %*

Reference Nos. or Marks *10, 11, 12, 13, 14 and 15.* Total Cost *£30*

Articles Sold or Transferred *One, 24/3/14.* Value *£5*

Ref. Nos.	Issues.		Returns.		Issues.		Returns.		Date depr'c'n. completed.	Stock March, 1912.				Stock March, 1913.				Stock March, 1914.			
	Date.	Address.	Date.	Engrs. sign.	Date.	Address.	Date.	Engrs. sign.		New.	Old.	Depreciated	Circuit.	New.	Old.	Depreciated	Circuit.	New.	Old	Depreciated.	Circuit.
10 11 12	24/2/12	— — —	6/1/13	F.H.	8/1/14	—			24/2/15	3	—	—	3	3	3	—	—	3	3	—	—

CARD No. 1A.

Arc Lamp HIRE ACCOUNT.

STOCK SUMMARY.

Apparatus card Nos.	Rate.	Stock at March 31st, 1912.				Stock at March 31st, 1913.				Stock at March 31st, 1914.				Stock at March 31st, 1915.			
		New.	Old.	Dep.	Circt.	New.	Old.	Dep.	Circt.	New.	Old.	Dep.	Circt.	New.	Old.	Dep.	Circt.
4	£5	3	—	—	3	3	3	—	—	3	3	—	—				
5	£5 10s.	1	—	—	2	—	—	—	3	—	—	—	3				

CARD No. 2A.

No. 4 is a further test record showing results of tests taken by means of a check meter. No. 5 is a detailed record of all motors connected to the mains. This book is found very handy for reference, and provides much useful information when corresponding with prospective consumers.

The following idea, recently brought to my notice, is one for keeping touch with goods loaned out on hire. It has the advantage of simplicity, yet contains all the desired information and detail, and, once brought up to date, gives no trouble in operation. Card No. 1A is for the purpose of entering each article delivered under this heading. If practicable—and that depends upon the amount of work in question—deliveries of similar goods in batches may very well be found on one card. The printed matter thereon, as shown below, will describe the purpose.

Card No. 2A is a quarterly summary of the whole of the before-mentioned cards; here, again, the printed matter explains fully its purpose. Figures have been filled in purposely to illustrate a little more clearly the intended idea.

Cards are mentioned, and in the instance in mind cards are used; but a loose-leaf book—or, better, two loose-leaf books—could be used for this purpose quite as well as cards; or, again, one loose-leaf book, and cards for the summary.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Mine Shaft Signalling.

The ADNIL ELECTRIC CO., LTD., of Adnil Building, Artillery Lane, E.C., has introduced a system of electrical signalling for mines, which has been specially designed to conform to the new mining regulations, and is a combination of its luminous and automatic systems, which have been installed in a large number of mines. Fig. 1 shows the "visual indicator," which consists of a dial mounted in a metal casing, the dial being arranged for 14 or more signals; a pointer is provided which denotes the winding signals

FIG. 1.—ADNIL MINING ENGINE-ROOM INDICATOR.

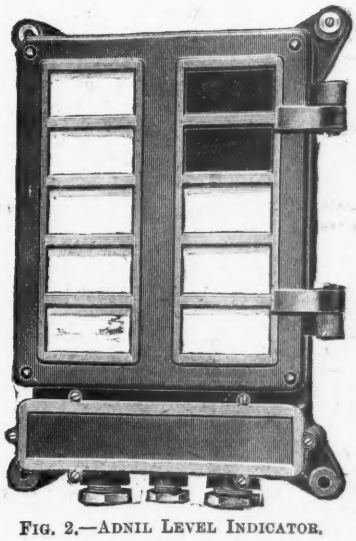


FIG. 2.—ADNIL LEVEL INDICATOR.

and a luminous indicator shows when men are being carried. The indicator, as illustrated, is mounted on a cast-iron pedestal which also carries the audible signalling instruments.

Fig. 2 shows a "level indicator"—a metal casing divided into a number of small compartments, with ground glass fronts, on which the names or numbers of the various levels are painted; these names are only visible when the lamp in the compartment behind one of them is caused to glow by a signal having been given. Other apparatus required to complete the engine-room equipment are a resetting contact, single-stroke bell, electric hooter and junction-box. Suitable modifications are made in the corresponding apparatus at bank and at the levels.

An electro-mechanical system is also made, with a special oil-immersed pull switch of heavy construction which is fixed at the bank and operated by a shaft signal rope, or can be used for haulage roads where insulated signalling wires are necessary. The engine room apparatus is the same as in the all-electric system, but at the bank a single-stroke bell is used, and mechanical bells are fitted at the levels.

A New Electric Horn.

A very cheap and compact electric horn for motor vehicles has recently been put on the market by the GENERAL ELECTRIC CO., LTD., of 67, Queen Victoria Street, E.C. The sounding mechanism consists of a substantial steel diaphragm, which is set vibrating by blows from a stud carried by the armature of a laminated electromagnet of special design. The mechanism, as in the case of earlier patterns of electric horn, is similar in principle to that of the common trembler bell, but embodies many novel points in design, while the construction is entirely different, being very much more substantial in every detail. Special insulating material and best quality metal is used throughout. The weight of the complete motor-car horn is as low as 2¾ lb. if fitted with the standard 10-in. projection, or only 2 lb. if fitted with the short projector, which is only 5¼ in. long. The finish is in black and nickel, or black only for fixing under the bonnet. The "Dean" horn is guaranteed for five years; it is watertight and dustproof, and the push switch supplied with it differs from the usual car push in that it is not a small button or plunger, but the upper cap effects contact over almost its entire surface, which is 1½ in. in diameter. A touch upon any portion suffices to close the circuit and sound the horn, which emits a rich, deep and penetrating sound.

The "Dean" motor-cycle horn weighs only 2 lb. and has a length of horn of 4¾ in. The internal and external arrangements are similar in all respects to those of the motor-car horn just described. The trumpet and case are of heavy sheet brass thoroughly plated

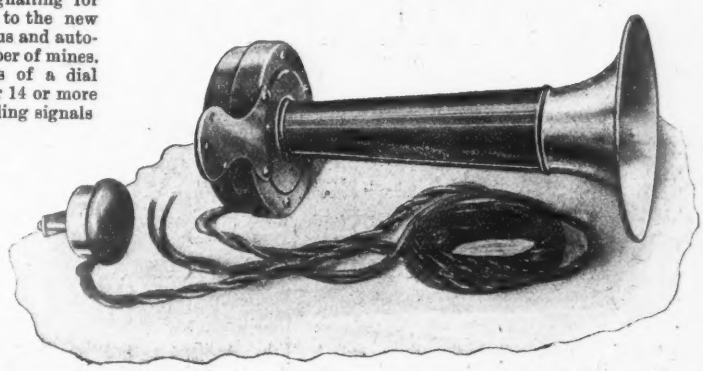


FIG. 3.—NEW G.E.C. MOTOR-CAR HORN.

The handle-bar clip is of solid construction, and so is the lever push switch, which also is arranged to clamp the handle-bar tightly in such a way that it will not shake loose afterwards.

The pressure required to work these horns is from 5 to 10 volts, and may be obtained from dry batteries, which may be carried in special cases for attaching to suitable parts of the machine. All the requisite parts are supplied by the makers.

The "Phœnix" Accumulator.

Many attempts have been made to devise a satisfactory light portable accumulator, usually with qualified success; MESSRS. "PHŒNIX" ACCUMULATORS, of 60, Wilson Street, Finsbury Square, E.C., are now introducing such a cell, which, they claim, is free from the drawbacks which have been previously met with, and can be depended upon to give good service with a life exceeding 300 charges and discharges. The construction of the cell is shown in the diagrammatic section, fig. 4, p. 1014; it consists of an outer ebonite container, within which is a perforated ebonite cylinder lined on the outside with a sheet of very porous material, and in the annular space is packed the negative active material, together with a light grid or electrode of antimonial lead. The positive consists of two concentric perforated ebonite cylinders, lined with porous material, and with the active material and a light grid packed between them; this is placed inside the cylindrical negative, and the electrolyte fills the two remaining spaces—the annular space between the two elements, and the cylindrical space inside the positive. Contact between the elements is impossible, because of the ebonite cylinders, and the granular active material cannot escape through the perforations, owing to the porous septa with which these are covered. Thus the cell is immune from short circuits and from the deposit of mud. The elements are held firmly in place, and the cover of the container is sealed in place.

It is claimed that the active material which represents 42 per cent. of the total weight of the cell, presents a very large surface of contact with the electrolyte, and makes good and permanent contact with the grids; that the elements are free from buckling, and that the cell has a high capacity—the output being 16·4 watt-hours per pound of total weight. Vibration and shocks do it no injury, and it can stand high rates of charge. The terminals are

lead-cased, and the cells are made up in convenient sizes for use as ignition cells, for lighting motor-cars and omnibuses, and similar purposes. Messrs. Wentworth & Co., electrical engineers, of 26,

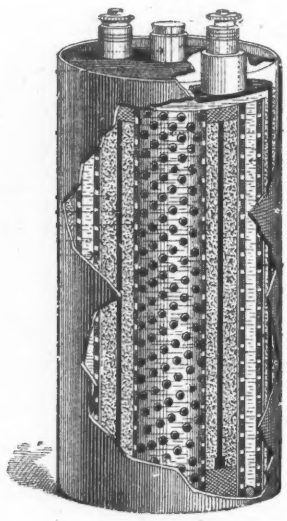


FIG. 4.—"PHŒNIX" ACCUMULATOR, PART SECTION.

Ivy Lane, E.C., inform us that they have had the Phœnix cells under test for six months, and are pleased with their behaviour; their ampere-hour efficiency is upwards of 85 per cent.

The "Fialite" Moist-Heat Radiator.

THE ALTHEAT CO., LTD., of 62, Oxford Street, W., have brought out a new type of radiator which appears to possess valuable qualities. The principle on which it is based is that a certain degree of humidity in the atmosphere is essential to our physical comfort; when air is heated, although no moisture is removed from it, its percentage humidity is nevertheless reduced, and the normal degree can only be restored by adding to its moisture content. This is effected in the "Fialite" radiator by the provision of a tank of water in the base of the apparatus, with wicks dipping into the water and extending upwards behind the lamps, as shown in fig. 5. The hot air rising carries with it a due proportion of

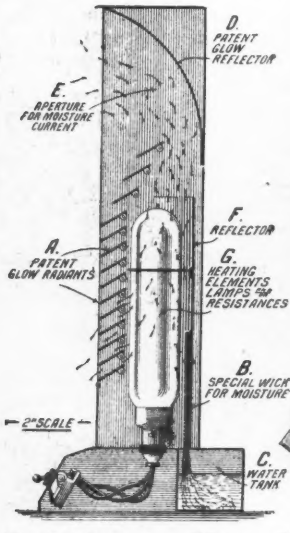


FIG. 5.—SECTION OF "FIALITE" RADIATOR.

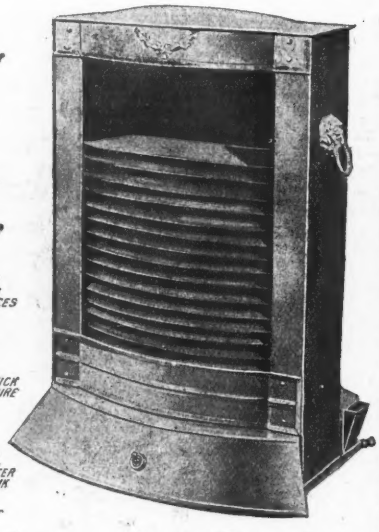


FIG. 6.—"FIALITE" RADIATOR.

added water vapour, and is deflected forwards into the room by the curved reflector above the lamps setting up an effective circulation of air. The makers state that the "moist heat" is far more efficient in producing an agreeable sensation of warmth than dry hot air, so that less power is required to heat a given space. The arrangement of the reflectors, which practically conceal the lamps, gives the appearance of a rich glow, as of a coal fire. Resistances can be used instead of lamps, if desired. The radiator is made in two models, one of which is shown in fig. 6, with four or six heating elements and two or three heats.

A PROFESSIONAL APPOINTMENT.

AT a recent meeting of the DUBLIN LOCAL SECTION of the INSTITUTION OF ELECTRICAL ENGINEERS the appointment of a wireman as staff engineer by the Corporation was discussed.

The CHAIRMAN said that at the outset he wished to make it clear that there was no intention of criticising the Dublin Corporation or the way they managed their important commercial undertaking. They were concerned simply with the broader issues affecting their profession, and the particular case which was before them was merely taken up as a foundation upon which to build something that would be of sufficient importance to attract the attention of the Council of the Institution of Electrical Engineers in London. The documents in connection with this case would speak for themselves. They would pass them on to London as they were, and with them would be sent such remarks as might be made at that meeting to strengthen the case.

MR. T. TOMLINSON, rising to propose a resolution for acceptance by the Institution, said that this subject had been agitated for years. The occasion had come when their Association must act if it ever hoped to see its members recognised as a profession. This kind of thing was occurring not merely in Dublin, it had occurred elsewhere, it was probably occurring in every place where the electrical industry was in the hands of the municipality, because they might be quite certain that in those places their profession would not be represented on the Municipal Council, while the unprofessional man would be largely represented. If they were left in the helpless position in which they now were, they would be gradually squeezed out. The high gods of the profession who ruled in their Council were ignorant of the conditions under which the Provincials were trying to eke out a living. Fortunately in their last fight the various local sections became united together, and they had now a power of putting their views before the Council in London which was not possessed by either the Civils or Mechanicals. After quoting an article on the status of the electrical engineer which was published in the ELECTRICAL REVIEW in 1909, he concluded by pointing out that the author pleaded for two things as necessary:—(1) A standard of professional training; (2) Parliamentary protection. They had since got the first; they wanted the second, and that was the resolution before them.

MR. PORTE said he had great pleasure in seconding the resolution which their hon. secretary had just proposed. The foundation of this business, as Mr. Tomlinson had suggested, started in Report No. 86 of the Electric Lighting Committee of the Corporation, dated April 13th, 1913. That report was submitted to the Council on July 7th, 1913, and was passed. The last paragraph, which affected them most, said: "The Committee have also made an order expressing their opinion that members of the staff desirous of promotion should obtain Associate Membership of the Institution of Electrical Engineers by passing the necessary examination, and, with the approval of the Council, the Committee propose that in future cases of promotion, and when applications for annual increment come before them to take this question into consideration." As far as he was aware, the first case in which that new rule should have come into operation automatically was the case they were dealing with, and he had before him Report No. 56, of 1914, which embodied a letter from Mr. Ruddle (city electrical engineer) giving a list of 10 engineers who had applied for the appointment which was then under consideration. The report says: "Mr. Ruddle further stated that in order that the arrangement should be of full value to the department, assistance to Mr. Elward could only be given by a highly-trained electrical engineer of the class possessing the qualifications to act as assistant shift engineer at the generating station, as he would have to carry out the full duties in one district, while Mr. Elward was engaged in another." That was the report of the Committee, and then followed Mr. Ruddle's letter, and out of the 10 members of the staff who went forward, he named four. After giving their qualifications and length of service, he proceeded: "Having regard to the importance of the duties to be performed, he strongly recommended in the best interests of the Corporation that the appointment be made from one of the four engineers named." Then he reminded the Committee of their own recommendation which was adopted by Council in the previous year, and after that came this election [of the unqualified man, who was not one of the four engineers recommended]. The question was—Could not they, by bringing pressure to bear on the Institutions, he meant the whole of the Institutions—the Civils, the Mechanicals, and the Electricals—could not they enforce what they had been talking of for the last 20 years—Parliamentary recognition of the profession? The Civils had none, the Architects had none, the Mechanicals had none, they, themselves, had none; that was, to say, that of all the learned professions, the only one that had not a statutory standing was the one on whose work the whole fabric of modern civilisation was based. The engineer's work was an everlasting monument to him, and, therefore, if on nothing else but on the broad ground that an engineer's work remained as a monument to the man who put it up, they should be protected by law against the interference of non-professional men in every class of engineering work. The only other observation he would make in support of this resolution, which he seconded with great pleasure, was that if appointments of this class were to be made in the way in which this appointment had been made, it would take the backbone out of the staff for ever.

MR. PILDITCH supported the resolution, saying that it was clear that until some such protection was afforded by legislation the

letters M.I.E.E. or A.M.I.E.E. were to all intents and purposes useless, for they carried no weight whatever.

Mr. Tatlow, also supporting the resolution, said that one way they should look at this matter was from the University man's point of view. The engineer who had spent several years in some University, and had spent a considerable sum of money in obtaining a degree in engineering, found that in the absence of something in the nature of Parliamentary support or recognition for his profession, the degree meant very little to him. He found that he did not acquire any great position by gaining the degree, whereas, the doctor of medicine when he went through the same University course, or perhaps a couple of years longer with slightly more fees, on getting his degree found himself in a sound position, because he was recognised by the Legislature as a professional man, and he could always get work without any fear of being interfered with by people who did not know his business, but thought they did.

Mr. Cummins and Mr. Downey having followed on similar lines,

The Chairman, in closing the discussion, said that as they were all so unanimous about this resolution, and the discussion had been so practical and useful, he thought there was nothing for him to say further. He felt that if they could get the Council in London to take up the whole matter of getting legal protection for members of the Institution, they would have gone a long way, and have done a great deal of good. If they had had legal recognition, this particular case could not have arisen, but as it had arisen, he would only say, as an engineer responsible for a large concern, who had had to rely on the loyalty of a technical staff in critical times, he would consider it bad policy, to say the least of it, that anything should be done to give his staff just cause to consider they had been slighted or broken faith with in any way. The way to get legal recognition had been shown to them by other professions, which were now reaping the advantage of their perseverance and foresight.

The resolution given below was then carried unanimously :—

Report of the Committee of the Dublin Local Section of the Institution of Electrical Engineers to the annual general meeting, 1914, as to a recent appointment on the electrical engineering staff of the Dublin Corporation :—

At the Committee meeting held on 15th inst. a letter of protest, signed by 19 members of the electrical engineering staff of the Dublin Corporation, against a proposed appointment on the staff was brought before the Committee.

After very carefully considering this and other documents submitted, the Hon. Secretary was directed to address a letter of remonstrance to the City Council. (In the report the letter follows.)

The City Council met on the 18th, and confirmed the appointment by a small majority.

Your Committee again met on the 20th inst., further to consider the matter in view of this confirmation. The recommendation of your Committee is that this meeting should place on record its opinion :—"That this appointment is a direct attack upon the profession, and that the Committee be instructed to communicate with the Committees of the other Local Sections and with the Council of the Institution of Electrical Engineers, urging upon them the necessity of immediately promoting such legislation as shall protect the trained professional engineer in the exercise of his profession, as the trained professional man in other professions is protected."

Thomas Tomlinson, *Hon. Sec.*

The Water Power of the Rhine.—The question of the economic importance of the Rhine between Strassburg and Lake Constance was raised in a paper submitted by Dr. Sympher, of Berlin, at a conference held at Mannheim by the Baden Chambers of Commerce on May 7th. After discussing a scheme for improving the navigable way of the river at a cost of several millions sterling, and for the accommodation of ships of 1,000 tons, the author referred to a proposal for utilising the available water powers in connection with the suggested improvement works. The water powers capable of being usefully applied on the Upper Rhine between Strassburg and Constance, leaving out of consideration the falls of the Rhine at Schaffhausen, are estimated at about 500,000 KW., which is constant for the greater part, and variable for a small part, but is, nevertheless, available during most of the year. It is calculated that the 500,000 KW. would enable 3,000,000,000 KW.-hours to be produced yearly, or a total considerably in excess of the quantity which was sold by the electricity works in Germany to third parties in the year 1911. The use of water powers in the South of Germany and Switzerland has rendered it possible for energy to be disposed of at exceptionally low charges, and if the scheme proposed by the author were carried into effect, the promoters would have to reckon with considerably lower receipts than obtain in the more level districts of North Germany. Under these circumstances, the opinion of experts is that the annual income would not exceed £4 per KW. for constant supply, and about £2 for the variable supply. If it is assumed that 250,000 KW. would be constant and 250,000 KW. variable, the total annual income is computed at £1,500,000, of which £900,000 would devolve upon the section of the river below Basle, and £600,000 upon that above Basle. It is estimated that the £900,000 would suffice to pay the interest and redemption charges of the debt incurred, and the annual working and maintenance charges, in the execution of the river improvement works, together with the hydro-electric works and the requisite canals, between Strassburg and Basle. But the conditions on the section above Basle are considered to be less favourable in this direction.

NEW PATENTS APPLIED FOR, 1914.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

12,804. "Electrical egg-testers." F. du Bois. May 25th. (Complete).

12,814. "Slip-rings for dynamo electrical machinery." Siemens Schuckertwerke G.m.b.H. May 25th. (Convention date, May 31st, 1913, Germany). (Complete).

12,831. "Number indicator and advertising-medium for telephone machines and other advertisements." H. E. Barker. May 25th.

12,835. "Self-acting shunt or switch contrivance especially for electric cars with subterranean current." Stefan Bedecs. May 25th.

12,844. "Electric switches." K. Tilgmann and A. A. Malm. May 25th. (Complete).

12,867. "Electric heating-apparatus." C. O. Bastian. May 25th.

12,870. "Mouthpieces for telephones and other acoustic instruments." H. J. Quilter. May 25th.

12,874. "Heating unit or resistance element for electric heating-apparatus." A. Slatter and G. Wilde. May 26th.

12,885. "Electrical signals in mines and collieries." E. C. Theedam, Ltd. May 26th.

12,906. "Lamp-locking and anti-vibration device for incandescent electric lamp-holders of the bayonet-socket type." C. Wharram. May 26th.

12,910. "Method of generating electro-magnetic waves without mechanical motion." Egmont C. Hoegerstaedt. May 26th.

12,912. "Telephone switching-apparatus." Western Electric Co., Ltd. May 26th. (Franklin Tuthill Woodward, Belgium).

12,913. "Impulse-producing mechanisms." J. A. Kropf. May 26th. (Convention date, July 29th, 1913, United States). (Complete).

12,926. "Mercury motor meters." W. Hamilton and Ferranti, Ltd. May 26th.

12,934. "Effecting the automatic interruption of the current in electric conductors upon the occurrence therein of a short circuit or serious leakage." Felten & Guilleaume Carlswerk Akt. Ges. May 26th. (Convention date, May 26th, 1913, Germany). (Complete).

12,941. "Motor control systems." British Thomson-Houston Co., Ltd. May 26th. (General Electric Co., United States).

12,976. "Electrical Switches." H. W. Cox. May 27th.

12,979. "Electrical winding-mechanism suitable for winding-up clocks and the like mechanical devices." J. L. Greenberg. May 27th.

12,983. "Fool-proof safety lock for railway-carriage doors and other doors electrically controlled." J. W. Wollers, A. McCaw, and A. Wollers. May 27th. (Complete).

12,986. "Chains for supporting electroliers." E. J. Perry. May 27th.

12,018. "Telegraph receiver and keyboard telegraph transmitter." E. J. Kessels. May 27th. (Addition to 21,332/13). (Complete).

13,022. "Dynamo-electric machines particularly applicable for engine-starting systems." C. F. Kettering and W. A. Chryst. May 27th. (Convention date, July 14th, 1913, United States). (Complete).

13,044. "Electric accumulators." J. P. Haworth and Curt Wachs. May 27th. (Complete).

13,049. "Starting-up of electric motors." Siegmund Hans Eckmann. May 27th.

13,057. "Dynamo-electric machines particularly applicable for engine-starting systems." C. F. Kettering and W. A. Chryst. May 27th. (Addition to 13,022/14. Convention date, September 13th, 1913, United States). (Complete).

13,060. "Construction of electric switch." G. Markt. May 27th.

13,062. "Signalling systems particularly for use in mines." Sterling Telephone & Electric Co., Ltd. and F. G. Bell. May 27th. (Telephon Fabrik Akt. Ges. vorm. J. Berliner, Germany).

13,063. "Cooling electrical machinery." C. H. Lauth. May 27th.

13,076. "Manufacture of tungsten." British Thomson-Houston Co., Ltd. May 27th. (General Electric Co., United States).

13,078. "Selector which during the emission of a series of current impulses permits of adjusting a fresh series." H. G. Dietl. May 27th. (Complete).

13,086. "Apparatus for reproducing any number of pencils of light in succession or together by means of electrical action." A. M. Low. May 28th.

13,095. "Galvanic batteries." A. Thomas and J. Stott. May 28th.

13,136. "Electric polyphase commutator machines." Siemens-Schuckertwerke G.m.b.H. May 28th. (Convention date, June 21st, Germany). (Complete).

13,147. "Series-parallel control systems for electric motors." British Thomson-Houston Co., Ltd. May 28th. (General Electric Co., United States).

13,159. "Dynamo-electric machines." Compagnie de L'Industrie Electrique et Mecanique. May 28th. (Convention date, May 30th, 1913, Germany). (Complete).

13,173. "Automatic telephone exchange connexions." Betulander Automatic Telephone Co., Ltd., G. H. Bryant, and F. M. Ward. May 28th.

13,209. "Process for banding projectiles." S. O. Cowper-Coles. May 29th.

13,210. "Process for rendering iron and steel surfaces incorrodible." S. O. Cowper-Coles. May 29th.

13,213. "Tightening-devices for overhead electric conductors." Siemens Schuckertwerke B.m.b.H. May 29th. (Convention date, May 29th, 1913, Germany). (Complete).

13,231. "Systems of control for electric motors." British Thomson-Houston Co., Ltd. May 29th. (General Electric Co., United States).

13,232. "Liquid rheostats." British Thomson-Houston Co., Ltd. May 29th. (General Electric Co., United States).

13,247. "Vacuous tubes used as magnifiers and producers of continuous electrical oscillations." Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. May 29th.

13,248. "Production of continuous electrical oscillations and the utilisation thereof for wireless telegraphy and telephony." Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. May 29th.

13,281. "Telephone systems." T. Green. May 30th.

13,304. "Electric cooking apparatus." W. P. Perry. May 30th.

13,305. "Electric thermostat." W. P. Perry. May 30th.

13,310. "System of electric signals for main and tail haulages in mines and like places." G. B. Burrows. May 30th.

13,331. "Electric detonators and fuses." J. Leighton and W. W. Twigg. May 30th.

13,335. "Electric relays." Soc D'Electricite de Paris. May 30th. (Convention date, June 21st, 1913, France). (Complete).

13,338. "Plans or systems with pertinent apparatus for the complete equipment of an automatic selecting lock-out of intermediary stations and interconnecting telephone system which combines an entire telephone plant." O. Asmussen. May 30th. (Complete).

13,348. "Electrically-heated vulcanizing apparatus." W. T. Henley's Telegraph Works Co., Ltd., and H. Savage. May 30th.

13,349. "Intercommunication telephones." F. Weingartner. May 30th.

13,359. "Electric clocks or timepieces operated and controlled by wireless waves." Eugene Victor Gratze. May 30th.

13,362. "Telephone exchanges." C. A. W. Hultzman. May 30th. (Convention date, June 2nd, 1913, Germany). (Complete).

EXPIRING PATENTS, TAKEN OUT IN 1900.

(*Continued from page 972.*)

7,777. "Wireless Telegraphy." Marconi, G., and Marconi's Wireless Telegraph Co. April 26th. Relates to improvements in the arrangements for wireless telegraphy described in Specifications No. 12,039, A.D. 1896, No. 12,326, A.D. 1898, and Nos. 6,982 and 25,186, A.D. 1899. The secondary of the induction coil is connected through one or more condensers to the primary of a transformer, the secondary of which is connected to earth or a capacity, and with an adjustable inductance connected to the aerial conductor. In the receiving apparatus the aerial conductor is connected through a similar inductance to the primary of an induction coil, with which a condenser is arranged in parallel. The secondary is divided by a condenser, and has its terminals connected to inductances. The inductances are connected through the coherer and a condenser in parallel. The local circuit, including impedances, is connected to the terminals of the condenser. Several forms of transformer and induction coil are described for use with the transmitter and receiver respectively. Several arrangements are described.

8,998. "Controlling Traffic on Railways." Smith, E. W. May 15th Relates to staff-issuing apparatus of the Webb and Thompson type, such as is described in Specification No. 1,263, A.D. 1889. In the present invention the catch which locks the usual notched disc is itself normally locked by a lever, adapted to engage a pin on the catch. When a staff is raised it turns the lever and releases the pin, so that, if the electromagnet is energized by a current in the proper direction, the catch will be disengaged. If, however, the proper current does not pass, the catch is not raised, and the further movement of the lever by the staff again locks the catch.

9,331. "Electrolysis." Haas, M. May 21st. Relates to bleaching compounds, etc. A cell is placed within, but raised slightly from, an outer vessel containing the electrolyte up to a certain level. Within the cell are a number of double-poled electrodes insulated by plates, and also electrodes for conducting the current into and from the apparatus. The hydrogen developed during electrolysis causes the liquid to rise about the electrodes, and to overflow from the cell, fresh liquid entering the cell through the perforations in the bottom thereof.

10,580. "Electric Furnaces." Imray, O. (Morani, F.) June 9th. In a large furnace, the electric connections with the electrodes are made by water-cooled metal boxes; the movable electrodes are held by screw yokes, also water-cooled. When several adjacent electrodes are supplied with alternating currents by independent conductors, these are placed at right angles to one another, or in line, where they leave the group of electrodes, to avoid induction between them. The liquid product of the furnace is discharged through a slit formed by a water-cooled metal casing, upon a cooled metal plate.

10,637. "Electric Resistances." Mayes, A. H. June 11th. Pulverulent resistant material is contained between conducting-plates fixed in a non-conducting box, under non-conducting pressure plates. The box is made with grooves to receive the conducting plates, bottom holes to pass binding-screws thereon, and lugs to which a lid is secured.

11,340. "Electric Clocks." Fischer, M. June 22nd. Relates to electric clocks; synchronizing-apparatus and escapements. In operating a number of electrical clocks, a wheel train driven by weights or spring power, is released, say, once every minute, by the action of the escapement-wheel of a clock on a releasing lever. This lever is pivoted and carries stop-pins to engage pins on an arm operated by gearing. The pin is used when setting the hands of one of the clocks. The arm is carried by a spindle, also carrying a soft iron cylinder cut away opposite pole shoes screwed on to two iron plates attached by clips, etc., to a steel magnet. The cylinder is surrounded by a fixed wire coil in circuit with coils on the pole-shoes. The induced current passes round an electromagnet at each clock. This magnet attracts a spring-withdrawn armature pivoted and carrying a regulating and shifting spring engaging the teeth of the minute-wheel. An ordinary telephone inductor, coupled with the wheel train by cranks, the wheel train being released and arrested as before.

11,562. "Electric Lighting." Hewitt, P. C. June 26th. Relates to vacuum tubes. A tube for lighting contains vapour of mercury or lithium, or nitrogen or other gas at a pressure of a few millimetres of mercury. Selenium, phosphorus, sulphur, or red sulphide of mercury may be added to facilitate starting, which otherwise requires heating of the tube by a Bunsen burner or electrically. A high electric pressure must be used in either case at starting. Afterwards the gas vapour in the tube conducts a considerable current at ordinary supply pressures.

11,933. "Controlling Electric Motors." Lundell, R. July 2nd. In order to obtain a great variety of speeds and minimize sparking in series-parallel motors, the field magnets are energized by a small regulable motor-generator, or from some other source of variable electromotive force.

12,972. "Electric Distribution." Highfield, J. S. July 18th. In order to keep the pressure constant in systems in which storage batteries are employed, and also to raise the bus-bar pressure to charge the batteries, a booster is arranged between the batteries and the wires.

13,036. "Dynamo-electric Machines." Joel, H. F. July 19th. Relates to the construction of dynamos and motors in which the field magnet is provided with a single exciting-coil, and the frame or casing forms part of the magnetic circuit. The single coil which constitutes the field winding is specially shaped so as to pass alternately on one side and the other of successive field poles. It is claimed that this construction will diminish eddy currents and armature reaction, and prevent sparking at the brushes. Modifications are described. The Provisional Specification states that the sinuous winding described may be employed in the construction of armatures, especially those of alternating-current machines.

13,721. "Electric Motors, Controlling." British Thomson-Houston Co., (Perry, C. L.). July 31st. Relates to a motor-control system for electrically-driven vehicles, etc., in which the controller comprises a number of separately-actuated contacts, with actuating-coils in connection with a master controller, the main object being to enable the several actuating-coils to be efficiently operated at full line potential.

13,975. "Electric Motors, Controlling." British Thomson-Houston Co. (Barry, C. E.). August 3rd. Relates to control systems in which the motor controllers are actuated from a master controller situated at a distance, for example, at one end of a train, and more particularly to those in which the contacts of each motor controller are actuated by a number of electromagnets connected with the master controller by a series of conductors running along the train. In order to reduce the number of train conductors, the coils of the electromagnets are connected across every pair of conductors, whereby as many contact-devices may be actuated from any given number of conductors as there are combinations of such conductors taken two at a time. The windings of the electromagnets are so proportioned that the corresponding contacts will only be actuated when the full potential of the actuating-current is applied at their terminals.

14,368. "Rheostats and Switches." Kando, C. de. August 10th. In the liquid resistance apparatus described in Specification No. 16,960, A.D. 1899, controlled by air pressure admitted through valves, a short-circuiting switch was provided, closed against spring pressure by the increasing pressure of the air when the resistance has been reduced to a minimum. The valves are now modified to ensure that, on reducing the air pressure, the switch shall be opened before the resistance is increased.

15,748. "Electric Apparatus." Partridge, G. W. September 4th. Relates to means for rupturing the arc formed when a switch or cut-out is opened or a fuse melts. The arc is blown out by a jet of fluid or vapour liberated suddenly, as by opening a vessel containing compressed carbonic-acid gas, such as a Sparklet, or by firing an explosive mixture.

16,130. "Electric Switches." British Thomson-Houston Co. (Hewlett, E. M. and Emmet, W. le R. September 11th. Relates to switches for high-potential currents of large amperage, the fixed and movable contacts being immersed in an oil bath.

16,290. "Electric Distribution." Campbell, G. A. September 13th. Relates to the transmission of energy by varying currents, and to inductance coils for increasing the efficiency in telephone and like systems. Inductance coils having an air gap or break in the magnetic circuits to prevent dissipative losses are distributed along the line in series, several in each wave length.

16,293. "Electric Furnaces." Imray, J. (Soc. Electro-Metallurgique Française). September 13th. An arc furnace, for reducing ores, or decarburizing or dephosphorizing cast iron or other metals, consists of a crucible of refractory material, in an iron casing, placed below two or more carbon electrodes, from which independent arcs pass to the fused material, the object being to avoid introduction of carbon into the material, so that, for example, soft iron, chromium, or manganese may be obtained.

16,389. "Dynamo-electric Machines." Phillips, J. September 14th. Relates to apparatus for trimming or trueing the commutators of dynamo-electric machinery while in position. A shaft carrying an emery wheel is driven from a pulley on a spindle carrying at its opposite end a friction wheel bearing against the commutator. Means are described for traversing the emery wheel along the commutator.

(*To be continued.*)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1913.

3,326. ELECTRICAL PRINTING TELEGRAPHS. B. Soldatencow. February 8th. (Addition to 14,659/10).

3,655. STARTING SYSTEMS FOR ENGINES OR THE LIKE. C. F. Kettering. February 12th. (September 19th, 1912).

3,857. TROLLEYS FOR ELECTRIC TRACTION SYSTEMS. E. M. Munro and R.E.T. Construction Co. February 14th. (Cognate Application, 11,630/13).

10,920. SYSTEMS FOR SUPPLYING FROM HIGH PRESSURE MAINS CONTINUOUS CURRENT AT A LOWER PRESSURE. E. A. Graham and W. J. Rickets. May 8th.

10,988. PUBLICITY DEVICES AND THE LIKE. C. Lean. May 9th. (May 10th, 1912).

11,115. MEANS FOR CONTROLLING ELECTRIC CIRCUITS. H. Leitner. May 10th. (Addition to 16,174/12).

11,177. TELEPHONE EXCHANGE SYSTEMS. E. R. Corwin. May 13th.

11,191. ELECTRIC ANNUNCIATOR FOR ELECTRIC BELLS AND THE LIKE. H. Mylo. May 13th.

11,274. REGULATING ELECTRIC CURRENTS PASSED THROUGH THE HUMAN BODY. E. E. Greville. May 14th.

11,370. STEEL MANUFACTURE. British Thomson-Houston Co. (General Electric Co.). May 15th.

11,371. WIRELESS TELEGRAPH TRANSMITTERS. G. Marconi. May 15th.

11,453. MEANS FOR DETECTING CONTINUOUS ELECTRICAL OSCILLATIONS. Marconi's Wireless Telegraph Co. and C. S. Franklin. May 16th.

11,506. SYNCHRONOUS DYNAMO-ELECTRIC MACHINES. E. Rosenberg. May 17th. (Addition to 9,644/12)

11,561. MARINERS' COMPASSES OF THE PROJECTOR TYPE. Kelvin & James White, Ltd., and M. B. Field. May 19th.

11,629. TROLLEYS FOR ELECTRIC TRACTION SYSTEMS. E. M. Munro & R.E.T. Construction Co. May 19th.

11,634. PROCESS FOR THE ELECTROLYSIS AND TREATMENT OF SULPHATE LIQUORS. E. J. Hunt and W. T. Gidden. May 19th.

11,975. PRODUCTION OF ELECTRICAL RESISTANCE MATERIALS. Resisto-Electrical Manufacturing Co. and C. Ruzicka. May 22nd.

12,919. ELECTRIC ARC LAMPS. A. H. Railing and A. E. Angold. June 4th.

13,135. DEVICES FOR BRAKING ELECTRIC MOTORS. J. Klinkenberg. June 6th.

13,988. ELECTRICAL ELEMENTS FOR COOKING. R. F. Venner. June 17th.

15,974. SPARKING PLUGS FOR INTERNAL-COMBUSTION ENGINES. Electric Ignition Co. (1913), & A. Cox. July 11th.

16,565. MANUFACTURE OF ELECTROLYTIC IRON. Soc. Anon. "Le Fer." July 18th. (August 2nd, 1912).

17,164. METHOD OF LOCALIZING THE RADIANT POINT OF ELECTRO-MAGNETIC WAVES AND APPARATUS THEREFOR. R. Wanibuchi. July 26th.

17,809. DEVICE FOR SECURING GLOBES, SHADES, CHIMNEYS, OR THE LIKE TO LAMPS. L. Severin. August 5th.

18,733. ELECTRIC POCKET-LAMPS. B. Lax. August 18th.

20,823. SELF-STARTERS FOR INTERNAL COMBUSTION MOTORS. K. Diehl. September 15th.

26,117. PRODUCTION OF A WHITE LIGHT RESEMBLING NORMAL DAY-LIGHT. P. Grosheintz. November 14th. (November 16th, 1912).

26,288. TELEPHONIC RECEIVERS. E. A. Graham. November 15th.

26,462. ELECTRIC HOT-PLATES AND OTHER HEATING APPLIANCES. W. A. S. Benson & Co. and W. J. Sims. November 18th.

26,602. METHOD OF AND MEANS FOR USE IN CONNECTING AN AUTOMATIC TELEPHONE SUB-STATION SYSTEM TO AN AUTOMATIC CENTRAL STATION. H. C. Steidle. November 19th.

26,708. WATERTIGHT TELEPHONIC, TELEGRAPHIC, AND LIKE ELECTRICAL APPARATUS. E. A. Graham. November 20th.

27,618. MOTOR-VEHICLE AND LIKE LAMPS. E. J. Lutwyche. December 1st.

28,286. ELECTRODES FOR SEARCH-LIGHTS. Geb. Siemens & Co. December 8th. (December 7th, 1912).

28,535. CURRENT INTERRUPTING-DEVICES FOR ELECTRIC IGNITING APPARATUS USED IN INTERNAL-COMBUSTION ENGINES. P. Schröter and J. Küster. December 10th. (December 11th, 1912).

28,630. ELECTROLYTIC CONVERTER FOR THE TRANSFORMATION OF ALTERNATING CURRENTS INTO CONTINUOUS CURRENTS. A. Heinz. December 11th. (January 21st, 1913).

29,221. RECEIVER FOR SUBMARINE SOUND SIGNALS. Signal Ges. December 18th. (December 18th, 1912. Addition to 2,185/13).

1914.

1,265. ELECTRICAL CONTROL SYSTEMS FOR MOTORS REPRODUCING PREDETERMINED MOVEMENTS AT A DISTANCE. R. Girardelli. January 16th. (January 23rd, 1913).

1,714. SEARCH-LIGHTS. C. Zeiss. January 22nd. (February 14th, 1913).

2,737. ARC LAMPS. C. C. Hughes. February 2nd.

2,918. ADVERTISING-APPARATUS. E. Mosse. February 4th. (February 14th, 1913).

2,935. CRYSTAL DETECTORS FOR WIRELESS TELEGRAPHY. A. L. Chaudet. February 4th. (March 27th, 1913).

4,321. EXERCISING AND ELECTRICAL CURATIVE APPARATUS. E. R. Smith and A. Turner. February 19th.

5,935. RECEIVING DEVICE FOR SUB-AQUEOUS SOUND SIGNALS. Signal Ges. March 4th. (March 19th, 1913).

8,021. DEVICES FOR THE TRANSFORMATION OF ELECTRICAL ALTERNATING CURRENTS INTO SOUND WAVES, USE BEING MADE OF RESONATORS TUNED FOR DIFFERENT FREQUENCIES. Kemp & Lauritzen (Firm of). March 30th. (March 29th, 1913).

9,570. ALARM THERMOMETERS. G. Edelmann. April 17th. (April 18th, 1913. Addition to 20,342/12).